COAL AGE

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Foreword

THIS first issue of COAL AGE is the realization of a long cherished ambition to give the coal and coke industries, employing 1,000,000 men, a weekly journal devoted exclusively to their interests. The necessity for an independent, adequate organ has long been acknowledged, and we intend to fill that need.

The work, although conceived as a business venture, is supported by fraternal love and an everlasting desire for the betterment of conditions in and about our mines.

Digging coal may not be exactly what Sherman called war, but if Hades is any darker or dirtier, and if the imps down there get any blacker, then we don't want to wait until New Year's to make good resolutions.

Now, Mr. Miner—You who forsake sunlight and who toil along underground day after day to furnish coal, the life sustainer of every industry, remember, we are interested in you. No matter whether you are drilling and shoveling at the face, or whether you are building brattices or fixing track, your success is our success, and COAL AGE will be devoted to a campaign seeking your betterment.

Although, in truth, contentment is seldom measured by money, the chances are you would change places with the fellow who owns the mine you work in, and, quite likely, if happiness be thus sought, you would be loser in the swap; however, most all of us are wanting the very things we can't afford, so we might as well accept the world-standard, and concede in part that "Money is success"; therefore, it is better to be fireboss or mine foreman than digger, and if you are already fortunate enough to hold one of the former positions, it is still more desirable to be superintendent or manager.

Right here is where we enter, for if you can read English, and have enough ambition to entitle you to recognition, COAL AGE will furnish you a schooling that will make it easy to climb to better things. Do your part—bear in mind that this journal each week will represent the best efforts of a large corps of experienced engineers; study the matter presented and you will find at the year's end, the time consumed has been well employed.

Write us your needs; state your problems; you will help us and the other fellow as well as yourself. You have muscle, health and heart—great assets; however, your head will carry you further than your hands.

Mr. Mine Manager and Mr. Engineer:

You have attained your present responsibilities largely through knowledge gained from the experience of others. The greatest advances in the coal industry have resulted from a broad exchange of ideas. Without resorting to oratory or idle boasts, we want to say that the foundation has been laid to make COAL AGE the greatest of all mediums for the interchange of coal-mining information. Every detail of European practice will be brought to you so long as that field leads us in any phase of the art.

This is not a paper for miners only, nor is it intended solely for men higher up; each individual can skip all that doesn't interest him, and still have plenty to occupy his time and thought. If questions and answers and elementary discussions of basic principles, that are prepared to aid the ambitious man who has lacked educational advantages, seem trivial, and you believe will not add to your enlightenment, then for the love of the lives of the men at the face, encourage, rather than condemn us. The calm of a peaceful day will be broken for many of you, because of a lack in the learning of some man lower down.

With your co-operation, we will be instrumental in putting the industry on a higher, safer footing. Your friendship is sought, but your confidence is desired above all. We will persist in our right to be independent even at the expense of criticism and censure. Realizing that, "A friend to all is a friend to none," we expect opposition; such, however, will but add zest to our work.

Now, when we disagree, and that may be often, we earnestly ask your forbearance. Perhaps our judgment is at fault—probably we have been misinformed; whatever the cause, we want you to know there are no rights reserved us and denied you. Our pages are open and criticism is more sought for than praise.

We will be around to see you and talk with you, time and time again; no plant worth visiting will be overlooked, and if you have anything to show, whether far or near, just send us word.

We intend, therefore, to see things first-hand, just as you do, and we trust that our point of view (always, if possible) will coincide with your own.

One word more—COAL AGE is before you; there has been no extra effort made to dress up just because it is our first appearance. We know this initial issue will not measure above the average—in fact, it is quite certain that before long the size and scope of the paper will be materially enlarged.

Anthracite and Bituminous Mining

By Eli T. Conner *

A comparison of the methods used in the two fields for the mining and preparation of coal, with an account of the different modes of occurrence, conditions and market requirements. In some cases the northern anthracite field might copy the methods of the bituminous regions. This is the first of a series of articles by Mr. Conner.

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The title of this article would appear to cover an enormous field of investigation and description, but it is not intended to give detailed reports but to refer briefly to the most important features of mining in the anthracite and bituminous fields of Pennsylvania and elsewhere, and to make comparisons where possible, of the methods pursued. Attention will first be given to the anthracite fields of Pennsylvania.

As is well known, mining on a commercial scale, was commenced in this region in the early part of the last century. The first known record of the organization of a coal-mining company in this field was in 1792, when the Lehigh Coal Mining Company was chartered, this being the origin of the Lehigh Coal and Navigation Company, which has been continuously in existence from that time down to the present. The first shipment of coal by this company was in 1802, when two ark loads of coal were floated down the Lehigh and Delaware rivers, to Philadelphia. Some of this coal was used for gravel walks on account of lack of knowledge as to the proper method of burning it. In the northern anthracite field, which will be the first discussed, in this series of articles, the Delaware & Hudson Canal Company was organized in 1823, and mining was commenced at Carbondale.

The northern anthracite coalfield extends from Forest City, in Susquehanna county, to Shickshinny, in Luzerne county, a distance of about 55 miles. The maximum width of this basin is 6 miles. The geological features of the northern anthracite field differ from the other anthracite fields in that the measures are comparatively flat; consequently it must be treated independently, and this article will be devoted exclusively to that region.

In order to illustrate the position of the various beds of coal underlying the Lackawanna and Wyoming valleys, I have incorporated four cross-sections, which are typical of the northern anthracite field, and give some idea of the methods adopted for the development of this wonderful deposit of anthracite coal. These cross-sections are taken from the Second Geological Survey of the State of Pennsylvania.

In the infancy of the business, our forefathers were confronted by many difficulties which we, of this generation, are sometimes apt to forget, when we criticize the methods they were compelled to adopt in order to develop a profitable business. I think it proper and right to make this statement, as in the progress of the article, it will be found necessary to make some criticisms which I believe are necessary for the improvement of mining methods.

As was quite natural, the earliest openings were made in what were believed to be the best, thickest and cleanest beds of coal and those which could be attacked by drift openings from the surface. For the ultimate winning of the maximum amount of coal, contained in the territory, this method was entirely proper where such beds of coal were the uppermost, but in most cases, throughout the northern anthracite field, the beds first developed were beneath others; the consequence of which is that, in many instances coal in overlying beds has been made irrecoverable.

The mining developments in the northern anthracite field and elsewhere, were first largely projected by men from England, Scotland and Wales, and most of the miners and laborers employed in these early developments came from the above-named countries, supplemented by Irish and Germans. Most of these pion-

CHIPPING COAL PILLAR, CLARK BED, PINE BROOK COLLIERY, SCRANTON, PENN.

TWENTY-INCH COAL BED, CAYUGA MINE, D. L. & W. COAL COMPANY, NEAR SCRANTON, PENN.

eers had learned coal mining in their own countries, and naturally adopted in this country methods which had been found suitable at home. These pioneers, as I have before said, met and overcame great obstacles in the early days of the industry, and left their stamp upon the whole anthracite region. Many of the methods which were inaugurated in those early days have, with modifications, come down to the present.

Almost without exception, the room-and-pillar method of mining has, from the beginning, been followed in the anthracite field. It was found that if about one-third of the coal was left in for roof support in the form of pillars, it was sufficient, and this proportion ruled to a very large extent and has been continued down to recent times. In fact, according to my observation, it has been adhered to, in many instances, where it was entirely inapplicable. As is well known, the relative proportion of pillar coal that should be left for the support of varying thicknesses of overburden has not been definitely determined. Because each coal bed has peculiarities of its own which affect its crushing strength, and because, further, the character of the overlying measures varies greatly, no hard and fast rule can be laid down to determine the percentage of pillar coal which should be left in, but each property and even each portion of any particular tract of land, must be considered entirely by itself, to determine this point.

The room-and-pillar method of mining which has been very generally adopted in the northern anthracite field, and with very few exceptions continued to the present time, is quite well illustrated by the cuts incorporated, which are taken from the contribution of H. H. Stoek, to the 22nd. annual report of the U. S. Geological Survey.

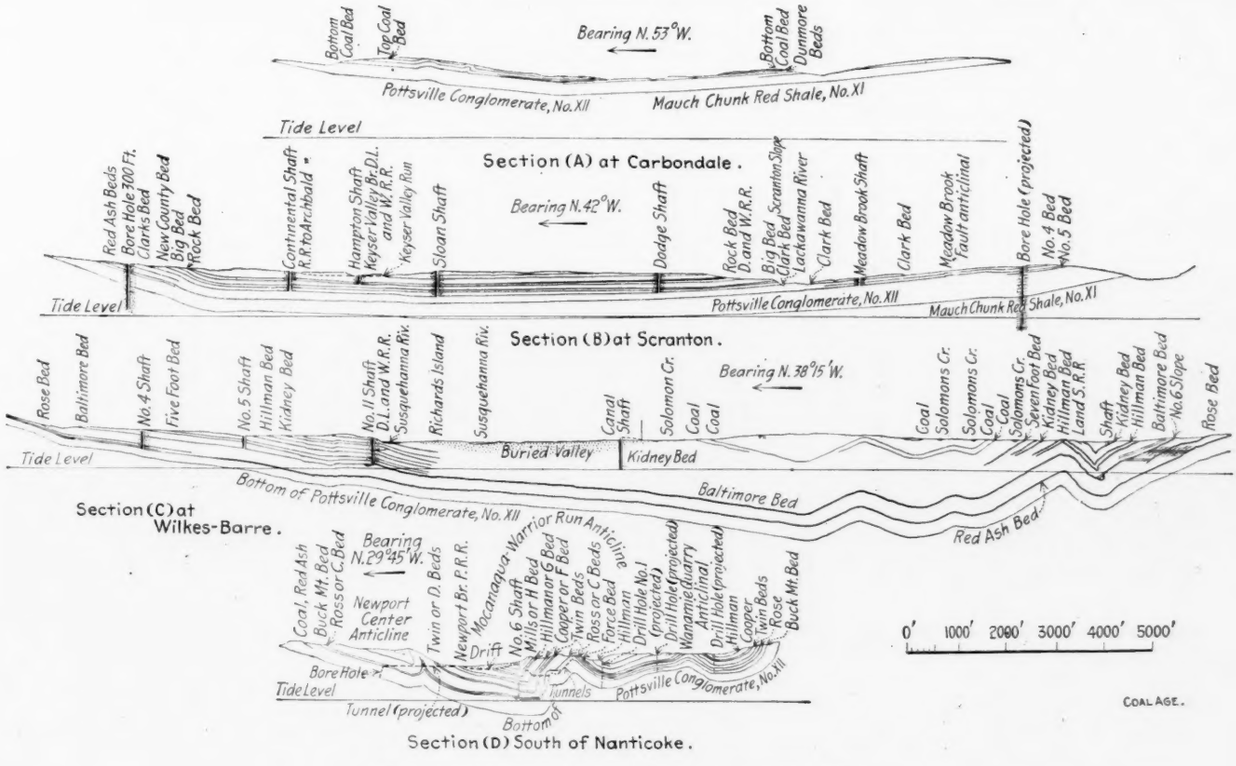
In the early mining in this field, as has been stated before, the developments were made in the middle series of coal beds, which in the vicinity of Scranton are known in descending sequence as the Diamond, Rock, Big or 14 ft., New County and Clark. These seams can be identified on the cross-sections accompanying this article, from which it will be noted that the names by which they are designated differ both east and west of Scranton. At Wilkes Barre the Big Seam is known as the Baltimore, while at Olyphant and eastward to Forest City, it is known as the Grassy Island. It very frequently happened in mining this and other beds of coal, in the earlier years of the industry, that but one or two benches of the seam were considered marketable, and consequently the other benches were either left in place, or broken up and thrown into the gobs. This resulted in the loss of a large quantity of coal much of which has not, up to the present time, been recovered. In addition to this great waste, care was not exercised to lay off the mine workings so as to bring pillars in lower beds under pillars in the bed immediately overlying. The result of this failure being extensive squeezes that have closed up large areas of the mine workings practically destroying the remaining pillar coal.

I have recently had occasion to investigate such a caved-in territory, due to the causes above mentioned, and found that 46 per cent. of the original contents of mineable coal has been almost irretrievably lost.

In recent years, more care has been exercised in the columnization of pillars, and a larger ultimate recovery can reasonably be expected.

One Reason for Unsystematic Methods

One of the principal reasons for the unsystematic methods of mining above mentioned has been that most of the early developments in this field were made by individual operators, holding the properties under comparatively short term leases, which carried burdensome minimum royalties, and thus compelled the operator, in order to retire his capital investment, and make a reasonable profit, during the term of his lease, to take only the cream of the property, oftentimes to the great detriment of the remaining mineral. During the past 20 years most of the individual operations throughout the anthracite regions have come into the possession of the 8 railway corporations, engaged in the transportation of anthracite to market. These companies have



Cross-sections of Northern Anthracite Field

generally adopted more scientific and systematic methods of mining, and consequently greatly reduced the waste from the causes mentioned.

Notwithstanding these decided improvements in methods, I am firmly of the belief that there are many places in the northern anthracite field in the thin beds of coal, by which is meant beds of 4 ft. and less in thickness, where decided economy in development and operation and in ultimate yield could be effected, by the adoption of the longwall system of mining. Strange as it may appear, when it is remembered that the anthracite fields of Pennsylvania were largely developed by men of experience from the British Isles, where longwall mining is the common and accepted practice, there have been very few instances and none of any marked success, of the introduction of this system in anthracite mining. It is true that the attempt has been made at various places, but so far as I can learn, it has never been systematically and persistently adhered to. Instead of this, to a very large extent, the methods that were adopted many years ago for mining beds of 5 ft. thick and upward, have with few modifications been continued in the thinner seams, in many cases even using the same old-style high mine car, which necessitates the removal of from 12 to 24 in. of roof or bottom rock, in *all openings*, to make hight for cars and mules. This, of course, means excessive cost of mining, and in my opinion, the system must be radically changed in the very near future, as it is only tolerated now because of the fact that at most of the going operations there is still some coal in the thicker seams which serves to "sweeten up" the average cost.

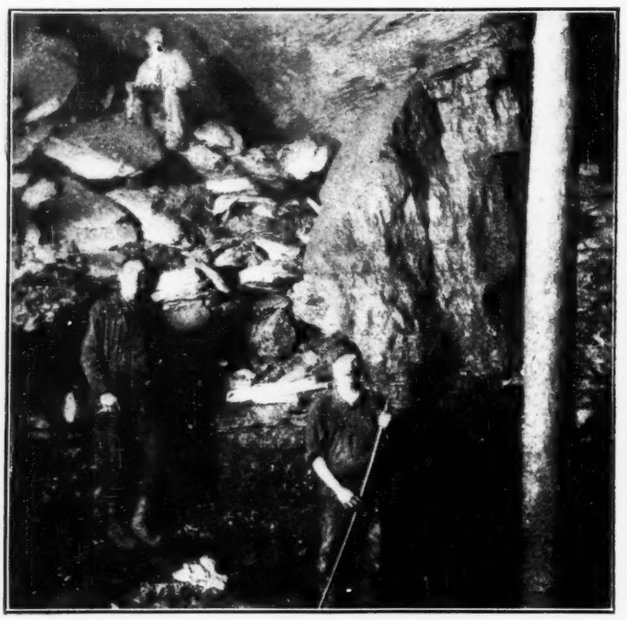
Underground Haulage

Underground transportation methods in the anthracite field have not been as completely revolutionized as has been the case in most of the bituminous regions. While it is true that most of the large anthracite companies have, in recent years, installed compressed air and electric haulage to a very considerable extent on the main roads, they still almost universally depend on animal power for handling mine cars in rooms. The use of gathering locomotives, electrically operated, has long ago passed the experimental stage, in the bituminous field, and in my opinion, would be adaptable in many of the comparatively flat seams in the northern anthracite field. Based upon experience with this method of transportation, in the bituminous field, I believe the average transportation cost in the comparatively flat workings in the anthracite field could be greatly reduced by the introduction of properly designed electric gathering locomotives.

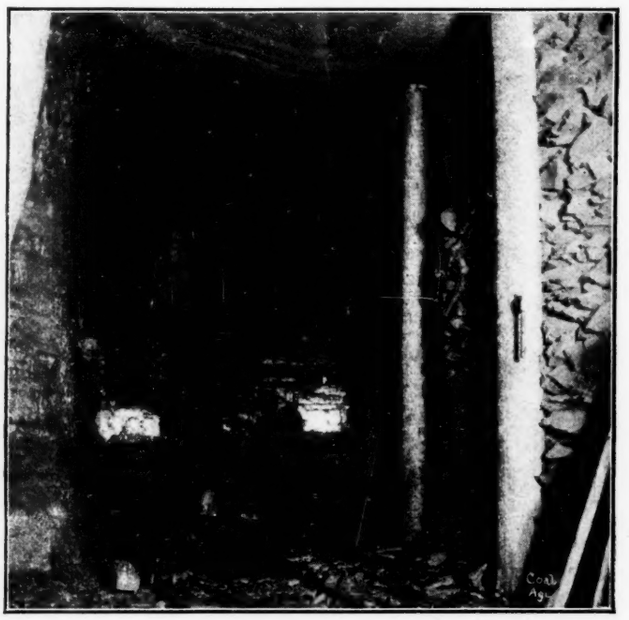
Space will not permit of going into detail on the criticisms here made, but I am quite convinced that anthracite managers would find it beneficial to investigate more carefully methods of mining and transportation that have been found economical in thin bituminous beds of coal.

The enormous increase in the amount of coal produced by mining machines in the bituminous fields in recent years, showing the steady improvement in apparatus and methods, together with personal experience in the operation of mining machines in bituminous coal, convince me that by such modifications as local conditions may dictate, this system of mining coal could be profitably adopted at many places in the northern anthracite field. I have recently been privileged to see a mining machine of the semi-longwall type in service at one of the mines in the northern anthracite field. This machine has been in operation for several months, and has proved a mechanical success, but as its operation is still in the experimental stage, the commercial results cannot at present be quoted.

I am informed that experimental work with similar mining machines is now in progress at other operations, but the results are not in my possession. This experimental work will probably be continued, as it is in the hands of capable and farsighted managers, who will doubtless carry the experiment to the ultimate outcome, and inform themselves as to the most suitable methods as developed elsewhere.



Second Mining of Rejected Bottom Bench Coal



Diamond Bed, Bellevue Colliery, Scranton, Penn.

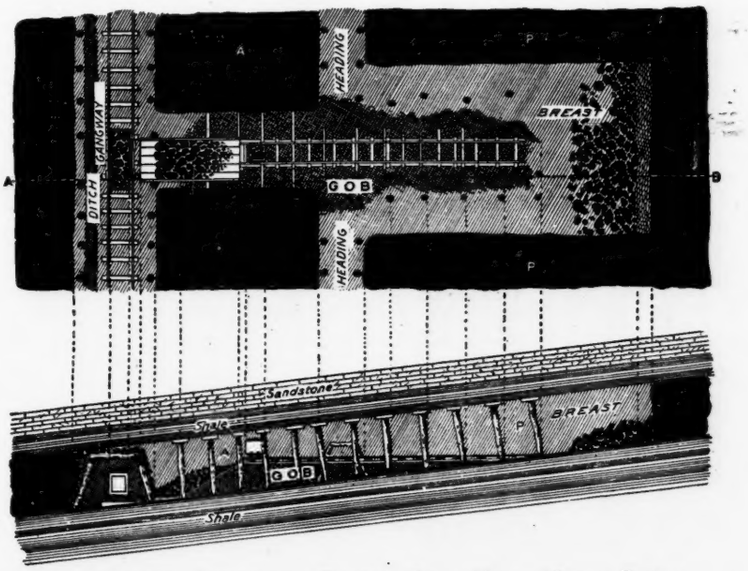
Preparation of Anthracite Coal

The preparation of anthracite coal for market is practically a manufacturing business that has been the growth of years of experience. It is a well known fact that to get the best results out of anthracite coal, in the furnace, it must be of uniform size. In the earlier days of the industry, it was believed that only large-sized coal, commercially known as lump, steamboat, broken, egg, stove and chestnut coal could be successfully burned. In consequence of which coal smaller than chestnut, which was made over 5/8-in. square mesh, was discarded and deposited on waste banks. In recent years, methods of firing have been so improved, that coal as small as that passing over 3/32-in. round mesh, can be successfully burned.

During the past 15 years a very large part of the culm banks in the anthracite

field have been rehandled and the coal smaller than chestnut marketed, until, at the present time, there is a comparatively small amount of such culm-bank material unused.

The sizes of coal larger than chestnut are commonly known as domestic sizes, and smaller than chestnut, as steam sizes. Domestic coal is sold at very much higher prices than steam coal, therefore the important matter for the manager to consider is the production of the maximum quantity of domestic sizes. Within recent years, great improvements have been made in this particular, by the proper design and arrangement of the rolls and other machinery, in the breakers, where the coal is prepared. This question of preparation of anthracite coal has been very well covered recently in a paper read before the American Institute of Mining Engineers, in June, last, at the WilkesBarre meeting, by Paul Sterling, chief mechanical engineer of the Lehigh Valley Coal Company, in which he quite fully described the new breaker recently constructed by that company, at Mineral Spring colliery. The yield of domestic sizes at that breaker is large.



BUGGY BREAST, ANTHRACITE REGION. ON A 10- TO 18-DEG. PITCH

COMPARING THE EFFICIENCY OF PLANTS

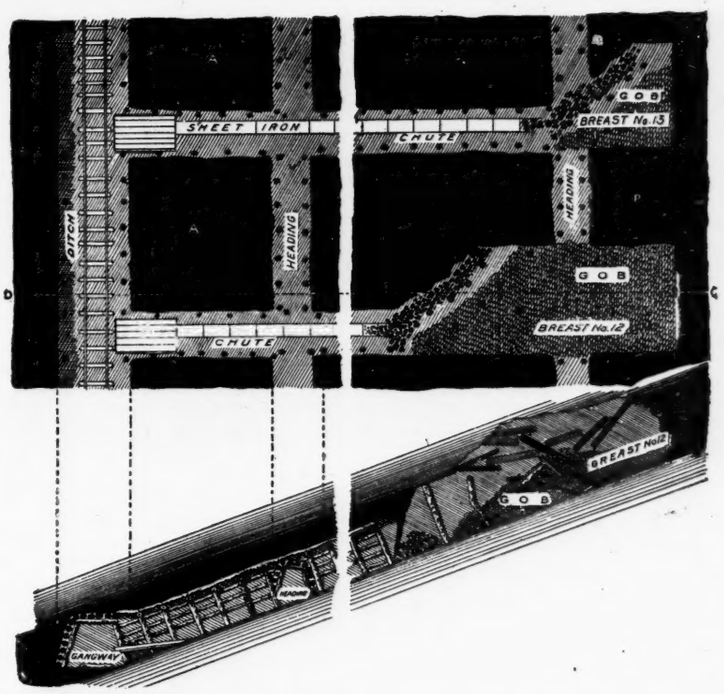
It has been the usual custom to compare the yield of anthracite-coal breakers on a basis of the percentage of domestic sizes produced. A proportion of 65 per cent. of total output of breaker in prepared sizes is regarded as good practice. This method of comparing the efficiency of plants and of their management is misleading, for it may be possible that a particular breaker is not recovering the maximum amount of small coal, viz: Coal below the size of chestnut. In such a case, the *percentage* of prepared sizes would naturally be high, and the operator would perhaps delude himself with the belief that he was accomplishing good results, when, as a matter of fact, his plant might be losing many tons of recoverable small coal.

The unreliability of the percentage method of determining results was forcibly brought to my attention some years ago, when in charge of 10 or 12 anthracite plants in the Wyoming valley, and a method of calculating and comparing percentages was devised which has since been adopted, and I believe it is the only true method of making comparisons. This was to determine at each breaker the yield in gross tons of each size per 100 cu.ft. of run-of-mine coal going into the breaker. On this basis, I have recently found breakers producing as low as 1.50 gross tons of prepared or domestic sizes, and others producing as much as 2.10 tons of prepared coal. In both of these cases, the character of the raw coal going into the breaker was about the same. The great disparity in results was entirely due to the manner in which the coal was handled in the breaker.

In comparing the final results in the production of anthracite and bituminous coal, it should always be remembered that while approximately 95 per cent. of the bituminous coal loaded into the mine car is a marketable product at practically full market value, anthracite coal, on account of the preparation necessary to make it marketable, is subjected to a loss in breakage, and degradation of sizes, which amounts to about 25 per cent. of the raw material loaded into the mine car at the face, in the northern anthracite field, and in the sounthern field the loss is frequently much greater.

Before leaving the northern anthracite field I think it desirable to mention more in detail the mining practices and conditions which result in great loss of high-grade fuel annually.

While it is well known in the anthracite fields, it may not be realized elsewhere that nearly all anthracite coal is mined by shooting it off the solid. This method was doubtless the best in the early days, and the results attained were reasonably good, when experienced coal miners were employed, but it is a well known fact that for the past 20 odd years, the proportion of such trained miners has steadily decreased, and their



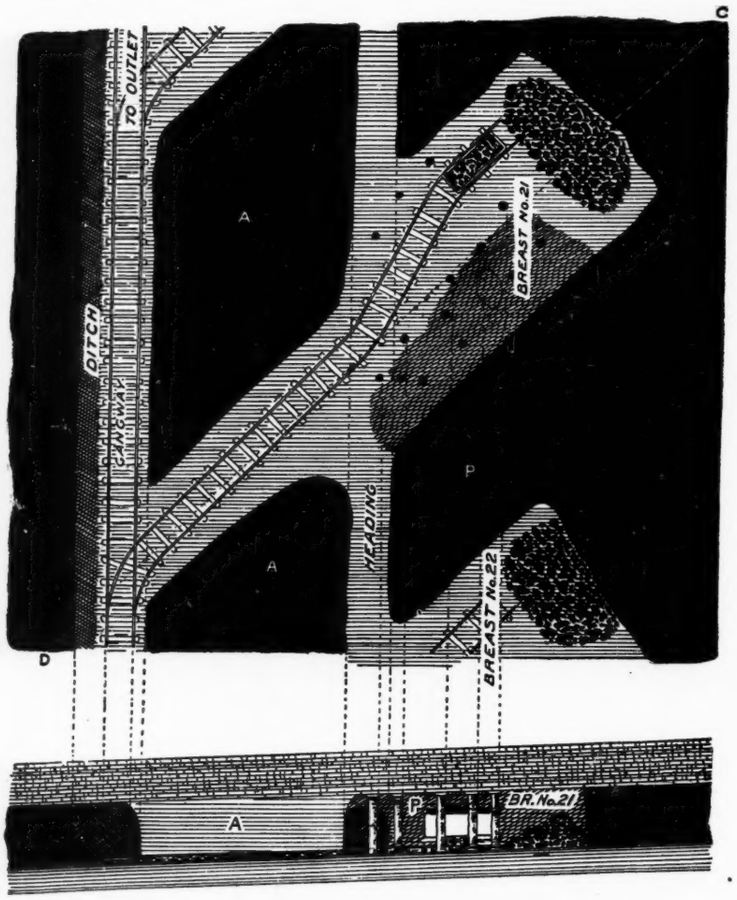
SHEET-IRON CHUTE BREAST, HAVING A PITCH OF FROM 18 TO 30 DEGREES

places have been taken by men from the southern and central countries of Europe, who have had no training whatever in the mining of coal. On account of these inexperienced men being unable to understand the English language, it is very difficult to educate them into competent coal miners; consequently many of them only learn how to drill holes in the coal, put in an excessive quantity of powder, and blow the coal into culm or slack, throwing large quantities of it into the gob, where it is lost. The percentage of waste by this method of mining is greater in the thin beds of coal by reason of their being generally of a harder nature than beds of greater thickness.

when they come here, are generally young and vigorous, rapidly become Americanized.

A Source of Waste

Another source of very great waste of good fuel has been referred to before, but it will bear repetition. In the early days of marketing anthracite coal, it was thought that only the bright, lustrous, glassy coal could be successfully burned, and the public was educated to that belief. As is well known, nearly every bed of coal carries one or more benches of what might be termed "second-grade" fuel, commonly designated as "bone." The operator and the miner are expect-



Wagon Breast, Anthracite Region, Under 10 Deg. of Pitch

While the employment of such large numbers of inexperienced miners from the European countries mentioned (about 65 per cent. of all of the employees in the anthracite field), results in considerable waste of good coal, it must not be inferred that these men are generally incompetent, as it has been my observation that very many of them learn quickly and make most excellent miners when properly instructed by English-speaking men of ability, tact and patience. It has further been my observation that the Hungarians, Poles and other men from Central Europe who,

ed to discard practically all of this material, very large quantities of which will analyze between 65 and 75 per cent. of fixed carbon. In order to compel the miner to discard this "off-color" coal, he is regularly docked if any noticeable quantity appears in his mine car when it is dumped into the breaker. Therefore, in self-protection, he must throw into the gob anything that appears to him to be doubtful. The large quantity of good coal which is thus irretrievably lost can hardly be conceived. A noticeable instance of this wastefulness, which is forced upon the coal operator by unreasonable market demands, is the treatment of a bench of coal in the Red-Ash bed, in the vicinity of Wilkes-Barre, which is known as Blue Coal. This bench varies in thickness from 18 in. to 3 ft., and as will be indicated by its designation, the only thing wrong with it is that it lacks luster. The major part of this bench of coal will analyze in fixed carbon very close to the average of the balance of the Red-Ash bed, but almost entirely on account of its appearance, it has for years been rejected.

I would recapitulate the causes of serious loss in the mining of anthracite coal in this region by reason of which over 40 per cent. of the original content in the ground is lost as follows:

1. Inadequate and improper pillar distribution.
2. Obsolete and wasteful methods of breaking down the coal.
3. Rejection of Blue Coal and good bone, and
4. Excessive and unnecessary breakage of the coal in course of preparation.

Governmental Insurance

The Miner's Relief Bill of Maryland provides for the assessment of 27c. per month on each operator for each employee engaged directly in or about the mines, and a like assessment on the wages of each employee. The tax on the operator is believed sufficient to pay the dependents of an employee, who is killed, $1500. The tax on the workman is expected to pay him a dollar a day for one year, or during disablement if he is not disabled for so long a time; $750 in case of loss of both hands or both feet, or one foot and one hand or loss of sight of both eyes; $375 is paid for loss of either hand, foot or eye, together with $1 per day for 26 weeks (Sundays excepted). The benefits are secured by application to the County Commissioners. If a release is accepted, the applicant waives the right to sue the operator on account of injury or death.

Car Oiling

Where cars are oiled at the foot of a shaft or slope, care should be taken to have the waste oil drained to a tank. The oil should be of high-flash point and it should flow with freedom at the temperature at which the oiling has to be performed. These are the general requirements of good practice anywhere, but they are peculiarly pertinent below ground. Had care been taken at Pittsburgh, Kan., to follow these rules, it would not have been necessary to heat the oil by putting heated car wheels within it with unfortunate results. All of which leads to the conclusion that in winter it is impossible to safely oil cars in the intake of a shaft or slope with ordinary winter oil.

High Humidity for Mine Ventilation

By Frank Haas *

The saturation of a mine atmosphere with steam is not for the purpose of furnishing the water for wetting the mine, but is done to prevent evaporation of water naturally in the workings. In shallow mines, high humidity does not injure the men.

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Humidity to the average person conveys a rather vague impression of the condition of the atmosphere. It is understood that this condition follows certain laws involving pressure and temperature and some physical characteristics of both air and water, but still the matter is considered of insignificant importance, and is left to the weather-bureau man who interprets with hazard his observation, and predicts with fair accuracy, but still imperfect results, the succeeding weather conditions.

At least so it has appeared to the mining man, and until recently, the humidity of the mine atmosphere was far from being a matter receiving his consideration. The air-compressor man has run into difficulties in the compression and transmission of air which have been charged to the humidity of the atmosphere, but so far has found no practical remedy. On the other hand, the iron metallurgists have, after a careful study of its effects, devised a method by which remarkable economies in the fuel consumption of iron manufacture are accomplished.

The mining man has, in recent years, been compelled by law to keep his mine wet in order to keep down the coal dust, which, when dry and in suspension, is considered dangerous, not only as a means of propagating, but even of starting an explosion. He has found in attempting to comply consistently with the mining laws, in so far as keeping all parts of his mine wet by the sprinkling method, that he has undertaken an impracticable proposition. A study of the atmospheric conditions of his mines will plainly show him why his efforts are futile and also show him the remedy. It is by no means an unusual condition of the atmosphere by which 15,000 or even 20,000 gal. of water may be exhausted from the average mine with normal ventilation in a day's time. It would be a difficult task indeed to transport and uniformly distribute such a quantity of water in each period of 24 hours.

Spray of Water Is Inefficient

Passing a current of air over a body of standing water will not saturate the air even though it is carried over a considerable distance. Introducing a spray of water into an air current does not accomplish the result, nor can it be accomplished in this manner unless a large number of sprays are used with a large waste of water. This method, at best, would be imperfect and if carried out to the extent of actual practical value would be quite expensive. The reason for its inefficiency is probably due to the fact that the air does not have sufficient time, in its contact with the water, to saturate itself, and the water, applied in comparatively large particles, is not maintained in the air current, but promptly drops to the floor where it remains worthless for the purpose.

The general laws governing the humidity of the atmosphere have been thoroughly worked out and the United States Weather Bureau has supplied us with tables showing the quantity of water for each per cent. of humidity for various temperatures and pressures. We have yet to learn, however, the rate at which the atmosphere becomes saturated, which involves both time and surface exposure. It is not unreasonable to suppose that the rate at which water vapor is disseminated would be proportional to the area of water exposed, although theoretically vapor tension is dependent entirely on pressure and temperature and independent of the medium.

It was with some surprise that it was found, while investigating the humidity of the atmosphere, that even during the time of heavy and continuous rain, the air was still far from saturated and the humidity well below the one hundred per cent. mark. This indicated what had previously been experienced along other lines; that it was no simple matter to raise air and hold it at the saturation point.

If the theory, held by many competent mining engineers, that a wet mine is safer against danger from a coal-dust explosion, either initial or in propagation is true, then humidity becomes a most important factor in maintaining the moist condition which the theory demands. In a previous paper[1] has been shown the large quantity of water which is extracted from a mine in winter months, and the dry conditon of the dust can be surmised under such natural conditions as are prevalent during most of the months of the year.

[1] *Bulletin* No. 425, U. S. Geol. Surv., "Explosibility of Coal Dust."

Saturating a Mine Atmosphere Prevents Evaporation.

The object of saturating a mine atmosphere with water vapor is not for the purpose of furnishing the water for wetting the mine, as is sometimes supposed, but for the purpose of preventing the evaporation of such water as is naturally there, or such water as has artificially been supplied. Theoretically, a place in the mine once thoroughly wetted and ventilated with a saturated atmosphere, will remain wet indefinitely. This then is the condition which should be attained.

The most favorable conditions for bringing air to the saturation point would be to have the water in the most minute particles and exposed to the air for a considerable length of time. The finer the particles, the greater surface of water exposed to the air. This is probably the most important factor, and if the particles are sufficiently small, they will be suspended in the air current and this will give the time exposure necessary. This favorable condition of water is exhibited when it is in the state of a fog, and it has been found that the saturation of air is both rapid and complete under these conditions.

To produce a fog in an atmosphere, it is necessary to lower the temperature of the air below the dew point or below the temperature at which the quantity of water vapor originally held will more than saturate it. The excess vapor will be changed to water in very finely divided particles. No practical method can be evolved from this, however, as temperature, as well as water vapor must be maintained and the outside air, when humidity is most desired, is both deficient in temperature and moisture; furthermore, the changing of the temperature of large volumes of air in a short interval of time is quite a difficult task. The simplest method is to disregard temperature and introduce an excess of moisture into the air by means of steam. The results attained are independent of its temperature, or pressure provided a sufficient quantity is introduced.

Temperature, as has been previously mentioned, is one of the important factors governing humidity. In winter time the temperature of the air entering the mine is usually lower than that normal to the workings, and even should such air be saturated when it enters the mine, it would still be greatly deficient in moisture when it reached the remoter workings. The temperature of a mine of considerable

development is fairly constant throughout and fluctuates but little during the seasons of the year. The air which is forced through the mine by the ventilating system rapidly conforms to the mine temperature, rising to this temperature in winter and dropping to it in summer.

The distance from the mine mouth to a point where the temperature of the air current is equal to that of the normal mine temperature depends on the heat of the day and the velocity of the current. Under ordinary conditions, this distance will not exceed 2500 ft. It is the first 1500 or 2000 ft. of the mine air current which must be brought up to the normal temperature of the mine atmosphere and constantly saturated to 100 per cent. humidity. The temperature will take care of itself from the radiation of the side walls of the entry and the fog from the steam traveling with the air current will constantly supply the water vapor necessary for saturation by the gradual increase in temperature. If, by this means, the air current carries 100 per cent. humidity at the point where it has reached the normal mine atmosphere, the rest of the mine will be found to contain a saturated air.

The System Requires That a Blowing Fan be Used

The capacity of an air current for carrying fog in suspension is so great, that there is no question of delivering sufficient for all practical demands. In fact in practice it has been found that it was necessary to watch the excess, rather than the deficit of water. Should there be a decided excess, then the fog will continue with the air in its course through the mine. Fog in working places, in manways or haulage roads, is an objectionable feature and should be avoided. This would demand that if steam is introduced into the air current it should be in the air course, where no person is supposed to travel except for inspection or repair purposes. It would further require that a blowing fan be used; the system can be used, however, with an exhaust fan. But it would require other than the ordinary entries for the intake.

When the sprinkling of mines was first agitated as a safety precaution against dust explosions, it was opposed by many with the argument that a wet condition of a mine resulted in the disintegration of the roof with additional fatalities; the roof being the cause of the largest percentage of deaths. These arguments and statements emanated from opinions rather than facts. It is a difficult matter to analyze statistics to the extent of definitely settling a question of this kind and the problem will find supporters on both sides for some time to come. It is a fact, however, that during the time sprinkling has been widely practised in the bituminous mines of this country, no material increase has resulted in the fatalities due to roof falls, nor has there been any noticeable increase in the expense of cleaning up roof rock, which would naturally result if any additional cause for such fall should be introduced.

From a theoretical standpoint, the argument appears rather in favor of wet mines. Most mines are naturally wet and when they are not ventilated the atmosphere in them is at, or near, saturation. Adding moisture to the circulating current or adding water to an artificially dry mine would be simply restoring the natural conditions, and by maintaining such conditions the disintegration of the roof should really be lessened. It is reasonable to believe that non-uniformity of conditions, notably of temperature and humidity, would have a more harmful effect than conditions made uniform by artificial means.

High Humidity Not Injurious to Men

It has many times been stated, mostly from theoretical grounds, that a saturated mine atmosphere is detrimental to the health of the coal miner and his capacity to do work. Whatever may be the conclusions based on the results of comparatively high temperatures (85 to 92 deg.) which are encountered in some of the deeper mines of Europe, we can affirm that in the bituminous mines of West Virginia, where the temperature will average about 60 deg. F. the year round, there has been absolutely no complaint from miners either as regards health or the ability to do work. It is probable that when higher temperatures are encountered the physiological effect of depression and fatigue will result from a saturated atmosphere, and under such conditions and results the method of atmospheric saturation would not be recommended, but as no such conditions, or if any, comparatively few, exist in this country, it can, therefore, be used to great advantage as a safety precaution.

During the past year two explosions have occurred in the Fairmont region of West Virginia. The coal mined in this region is highly volatile and is considered capable of making a dangerous dust. Both of these explosions were solely from firedamp, and arose from a sudden inflow of natural gas from a defective gas well situated in the vicinity. Both explosions were violent, doing considerable damage to improvements inside the mine. The extent of the explosions was localized to the part of the mine where there was an explosive mixture of gas and did not extend, or propagate beyond it. The conditions were favorable for a disastrous dust explosion and the reason that the explosion did not extend over the entire mines, or in fact over several connected mines, was attributed to the wet conditions therein and to the fact that the air had been kept saturated for some time previous. This is perhaps the best argument that has yet come under our observation and has increased our faith in wet mines as a preventative of coal-dust explosions.

Immediate Action after a Colliery Disaster

In summarizing the immediate action a manager should take in case of a colliery explosion, or other disaster, W. E. Garforth, English authority on rescue work and the recovery of coal mines, said:

"Telephone for the mine inspectors and government engineers at once. Send a motor car if they are within distance. Communicate with all emergency officials, and members of the rescue team, not in the mine; impress on them the necessity for coolness. Send for the colliery doctor and laboring medical men. Confer with the leader of the rescue party and the chief of the ambulance corps as to the appointment of members to descend with the first exploration party.

"If the hoisting appliances are disarranged, provide means of descending into the mine. If the fan drift is damaged, arrange for its immediate temporary repair. Boards overlaid with brattice cloth, or with strips of the same, are sufficient in the early stages of exploration work. Consider the advisability of using a steam jet in the upcast shaft, or of causing a downward current of air in the downcast shaft, by means of a waterfall.

A matter of great importance is to decide whether, in case of a fire, the fan should be kept running. This problem must be solved by the manager himself, as no general rule can be given; a definite knowledge of the special conditions is necessary to a correct solution. If the fan be kept running, the smoke will be drawn through the workings and imprisoned men run a greater risk of being suffocated; on the other hand, if the fan be stopped, firedamp may accumulate in the workings, or abandoned parts of the mine may give off unexpected quantities of gas, and cause a further disaster. I may say, however, that experience in past accidents indicates that the course to be pursued seems in favor of stopping the fan for a limited period, while an exploration is attempted.

The underground development of every mine should be so planned that convenient and safe locations are provided for the erection of fire dams in case of necessity. At least 30 ft. of narrow entry is necessary for the location of a substantial dam. Recently at one mine, where a strong fire was raging, it was found necessary to build a stopping 28 ft. in length. This wall consisted of alternate sections of firebrick, concrete and dirt.

Importance of Geology in Coal Mining

By I. C. White*

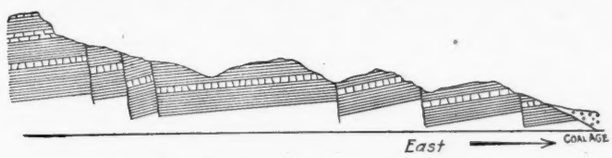
Geology essential to a proper solution of many engineering problems. Construction and maintenance cost of mine workings can be reduced by due consideration of geologic indications.

*State geologist, Morgantown, W. Va.

Geology, though one of the youngest of the sciences, is nevertheless one of the most useful. Neither the civil nor the mining engineer is properly equipped to grasp and successfully solve the many problems that are sure to confront him unless he possesses a practical knowledge of its laws and principles. This fact we may see strikingly illustrated along the routes of any of our great railway lines, in their cuttings, fills, and tunnels. At one point the engineer has made a deep cut into soft, easily yielding shales at the foot of a steep slope, where his track will long afterward be troubled with land slides which a knowledge of the character of rocks would have enabled him to avoid at only a tithe of the ultimate expense involved. At another point his line has been constructed over loose material near the bank of a river, and his road-bed remains unsafe and unstable, and his re-alinement expense large for years to come.

Again for lack of geologic training a long and expensive tunnel may be injudiciously located, as is the famous one near Alleghany on the Chesapeake & Ohio Railway, at the line between Virginia and West Virginia, where a change in alinement of only 100 ft. southward would have avoided a Pocono sandstone ledge nearly as hard as quartzite through which the tunnel was driven for nearly a mile before the days of dynamite or power drills, at a cost of many thousands more than would have been necessary in the overlying red shale, had the engineer recognized the dip of the rocks and their difference in character.

SECTION ACROSS YARROW COLLIERY



SECTION OF PAHRANAGAT RANGE, NEVADA

GEOLOGY ESSENTIAL TO COAL ENGINEER

To the coal-mining engineer especially, is a knowledge of geology essential in the correct determination of the many problems connected with successful mining. He must understand how to trace and keep hold of any particular stratum as a limestone, sandstone or other coal bed which may overlie the one he intends to mine, in order to determine quickly and cheaply the "lay" or structure of the strata in the tract to be operated, before definitely locating his entries or shafts. Otherwise he will incur a constant unnecessary expense in disposing of the mine water and assembling the products of the mine. Then, too, in mountainous regions, where one cannot follow readily the crop of any particular coal bed, owing to irregular or rapid dips, and where the several beds may be held by different parties, he may open the one not owned by the operator, or he may with insufficient knowledge erroneously advise the land owner that the bed he did not sell is being mined by the operator, and thus involve both parties in long and expensive litigation to determine the identity of the coal in question. This is not a conjectural case, but one that actually occurred only recently, and was determined by the Court in favor of the defense in June, 1911, after long and expensive preparation for trial by both parties to the controversy. Had the eminent engineer who advised the plaintiff in this case been sufficiently trained in geology, he would have saved both litigants much time and expense.

This question of the identity of coal beds is one of the most important problems with which the mining engineer has to deal, and unless he has had practical training in geology, the reports that he is often called upon to make on any particular coal property may be misleading. Certain coal beds are fairly regular in thickness and quality, are subject to few "rolls," "wants," or "clay veins," and are of good quality, while other beds in the same series may be characterized by exactly opposite features.

In the New Cumberland region of West Virginia, an eminent mining engineer is reputed to have mistaken the Lower Freeport or "Rogers" seam for the celebrated Pittsburg bed, and embodied this erroneous identification in a report upon a large coal property, while in southern West Virginia another distinguished engineer committed the same error in identifying the Pittsburg coal on a property along the waters of Big Coal river, where the horizon of that particular coal bed was 700 to 800 ft. higher.

In passing from one region to another widely distant in any coalfield, there is always danger of error in the identification of coal beds, especially when the intermediate regions have not been studied in detail. I fell into an error of this kind in my first (1884) study of the coals along the Great Kanawha river through accepting previous identifications by eminent geologists and mining engineers as correct, and thus confusing the greatly expanded Mercer series of coals with those of the Allegheny, until a brother geologist detected the error in a study of the fossil plants.

ROCKS OVERLYING A COAL BED

The character of the rocks overlying a coal bed will mean nothing to the ordinary engineer, but if he has geological training he will know that a coarse sandstone roof means frequent erosion or thinning away of the coal, and also long and expensive headings to be driven through hard rock, as well as a coal bed generally high in sulphur contents by invasion of sulphur-bearing waters from above. He will also know that a fireclay shale in the immediate roof of his mine will mean frequent and dangerous "falls" and much added expense in entry and mine maintenance. The character of the mine floor, too, will receive his attention, and from its peculiarities he will determine whether it will "heave" or otherwise when subjected to moisture and mine conditions after the overlying coal is removed, and it is called upon to sustain the pressure of hundreds of feet of rock material.

When operating coal beds in a region traversed by faults, a knowledge of the law of faults as illustrated in the classical case of the Yarrow Colliery by De La Beche, or that of the Pahranagat Mountain range, Nevada, by Gilbert, both of which are here republished, will prove of immense value in finding the coal after it suddenly disappears, settling practically always down the slope of the "over-hanging" wall of the fault.

Georges Creek Coalfield, Maryland

By R. Dawson Hall

A semibituminous field of great purity in Northwestern Maryland, where the application of modern methods has not only resulted in a high percentage extraction, but in economy of operation.

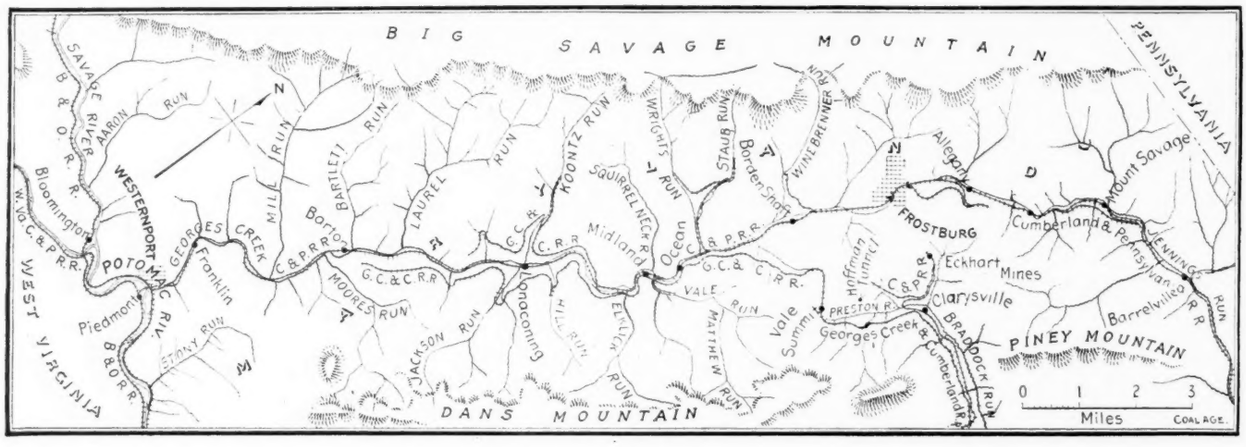
The Georges Creek field lies wholly within the synclinal named after that stream. The shape of the field is that of a canoe or spoon, the measures rising along the line of the strike, both northeast toward the Pennsylvania line and southwest toward Piedmont, W. Va., from a center of depression, situated at the pumping station of the Consolidation Coal Company, one-quarter of a mile east of Borden shaft.

This synclinal fold extends beyond Piedmont, W. Va., to the south, running along the northern branch of the Potomac, and this extension is situated partly in West Virginia and partly in Maryland. It exhibits in one place only, and that in insignificant degree, the "Big" or Pittsburgh bed. This lower coal area is not usually regarded as a part of the Georges Creek field, partly because of the absence of the most important beds of that region, and partly because the stream traversing the valley is no longer Georges creek, but the Potomac river. For this reason, this extension will not be treated in this report, the southern boundary line of the field to be discussed being the great bend in the river between Keyser and Bloomington, which completely cuts out all the coal measures, where it breaks through the Allegheny mountains.

To the west of the Georges Creek basin lies the big Savage mountain, and to the east lie Dans and Piney mountains, but whereas the coal-bearing formations extend up the slopes of those flanking elevations, the principal or Big bed is limited to the valley lying between them. The point of highest surface elevation along the basin is at Frostburg. Here is situated the ridge, which divides Georges creek from Jennings run. The direction of the synclinal fold is about N. 37 deg. E., being that generally found in the Appalachian field.

Despite the fact that the edges of the syncline are tilted up to as great an angle as 60 deg., and that the field is situated in the very heart of the Allegheny mountains, where vertical measures are frequently encountered, there are no throw-faults to make working of the measures difficult. On the whole the basin is regular and straight, though minor irregularities occur, which have made much ditching and even some tunnelling necessary in order to connect up the subsidiary basins with the central basin of the field.

Moreover, the coal is not broken, nor markedly prismatic in structure. In this it is very different from the coal in the first bituminous basin of Pennsylvania, which appears to have been more affected by Paleozoic violence. But there are other evidences which point to primeval stress. The cleats of the coal are not strongly marked, the lumps of coal shipped to market being rarely cuboidal. In some places the coal falls so easily that it is mined without shooting, and the roof is everywhere full of seams and tends to shear off shortly rather than to bend before breaking.



MAP OF GEORGES CREEK REGION, MARYLAND

CROSS-SECTION OF BEDS

The following cross-section shows all the beds to be found in this field, with the intervals between them; these intervals are not equal throughout the region, and it must be borne in mind that as figured in the table they are merely averages. The Upper Sewickley may be situated anywhere between 95 ft. and 125 ft. above the Pittsburgh bed, the interval gradually increasing toward the south. That statement will serve alone as an indication of the inequality with which beds in this region have been deposited. In the following table, the third column shows the interval between the bed mentioned and the next bed below.

Thus the Dunkard formation contains 7½ ft. of coal; the Monongahela, 26½ to 37½ ft.; the Conemaugh, 24 to 28 ft.; the Allegheny, 21 to 30½ ft., and the Pottsville, 8 ft.; making a total thickness of from 87 to 111½ ft. It will be noted that the Conemaugh, or Lower Unproductive measures, not only contain from 24 to 28 ft. of total coal contents, but also include one bed, the Bakerstown or Barton coal, which is worked at eight separate small operations in this region. It is possible that others may be worked later, and the fecundity of those measures here, and still more further south, well justify the United States Geological Survey in its insistence in the giving of purely place names to measures, rather than names expressive of conditions, which may change their character from region to region.

ECONOMIC IMPORTANCE OF BEDS

The importance of the various beds, as at present developed, is best shown by the following statement of tonnage in this field, as produced between May 1, 1910, and the same day 1911, calculated from the annual report, an advance sheet of

which was furnished me by the courtesy of John H. Donahue, State mine inspector of Maryland:

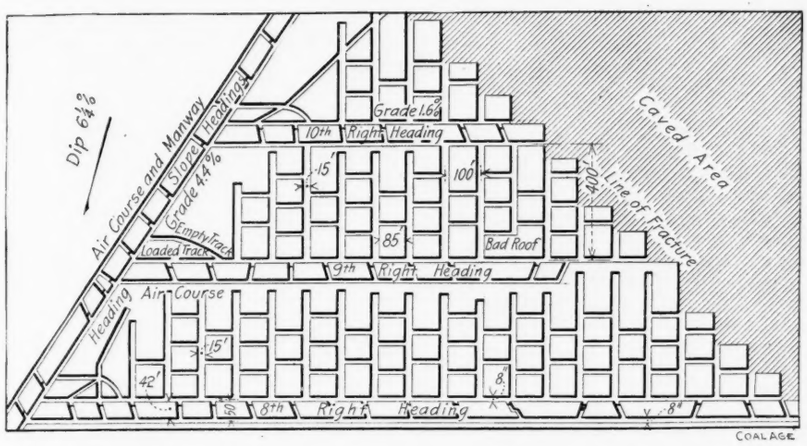
Name of Bed	Long Tons	Percentage of Total Production of Region
Pittsburg	2,921,278	72.7
U. Sewickley	535,340	13.3
L. Kittanning	317,960	7.9
Bakerstown	172,461	4.3
L. Sewickley	26,126	0.7
Clarion	23,982	0.6
Brookville	18,571	0.4
U. Freeport	500	0.1
	4,016,218	100.0

mined in its entirety. The upper part is called the "rashings," a coal high in sulphur and interstratified with bone coals and slates. It could be washed with excellent results, but this is never done. The rashings measuring from 3 ft. to 4 ft. and the draw slate below it running about 18 in. are hard to hold in place. When mining is conducted so as to leave them unsupported and to permit the air to work on the draw slate, they fall, and to retain them in place the top coal measuring from 8 in. to 30 in. is left as a protecting plate for the roof. This top coal is equal in value to the breast coal and strong plate, as rocks run in this region. The composition of the Big bed as shipped is as follows:

ANALYSIS OF "BIG" SEAM

Moisture	0.74 per cent.
Volatile matter	18.69 per cent.
Fixed carbon	73.88 per cent.
Ash (including sulphur)	6.69 per cent.
Sulphur	0.81 per cent.
Calorific value	14,491 B.t.u.

It will be observed that the coal is high in fixed carbon and low both in ash and sulphur. This absence of sulphur is perhaps the reason why Georges Creek coal does not spontaneously ignite, however stored, though the causes of such ignition in coal is a much debated subject. It also gives the coal its lead as a smithing fuel, much of it being shipped in box cars and even in sacks. As much as 10 per cent. of it is used for smithing purposes. Some of the coal is sold in Europe, Central and South America, Canada and the far West. It is also used as steam coal for the U. S. Navy.



NARROW ROOMS, LARGE PILLARS AND RETREATING SYSTEM CHARACTERIZE MINING IN GEORGES CREEK REGION

It will be seen what a lead the Pittsburgh bed has in this district, and this lead will continue for many years. The Big bed is by no means exhausted, but nearly all the holdings underlaid by this measure belong to the Consolidation Coal Company, and in the coming annual report that company will be shown to have mined 70 per cent. of the whole regional output from that bed. The unworked coal lies in the northern two-thirds of the field. It is 252 ft. deep in the lowest point in the region. This has proved a considerable obstacle in mining and has resulted in slower development where it had to be met. However, a long tunnel, known as the Hoffman, was commenced in 1903 and completed in 1906. Starting in Preston run, a small draft from Braddock run, at a level of 300 ft. below the Pittsburgh bed, and running two miles in a straight line, it taps the basin close to the pumping shaft, which is now only used as a manway and airway, and as a means of delivering power to the workings below. This tunnel, with the aid of subsidiary tunnels and deep ditches, will drain the whole Pittsburgh bed, and the coal deposited over it.

PITTSBURGH BED NOT ALL MINED

The Big, or Pittsburgh bed, which in the basin is about 14 ft. thick, is not some day an attempt will doubtless be made to save it in all new workings. Then the rashings will also have to be gobbed or removed. Fortunately the "little rock" above the rashings is a reasonably strong plate, as rocks run in this region.

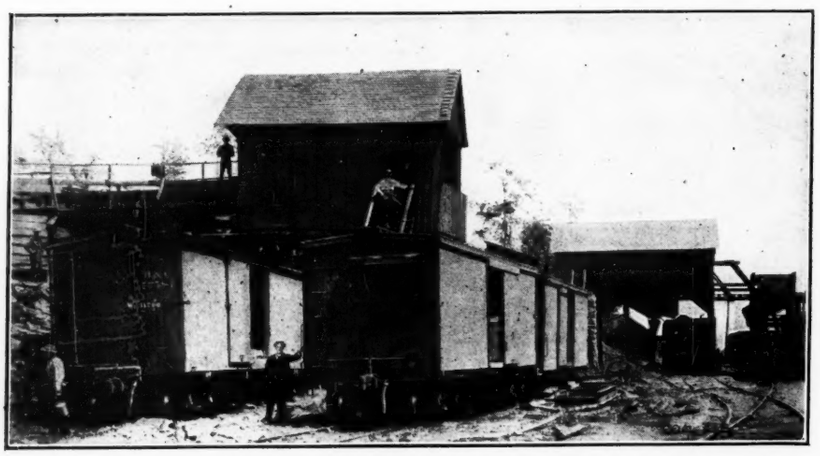
THE SEWICKLEY BEDS

The Upper Tyson or Upper Sewickley seam runs as low as the big bed in sulphur and ash and would well take its place in the market though the operating companies are keeping the coal from the two seams separate, having their dumps arranged with a movable baffle plate so that the Sewickley coal may go in one car and the Pittsburgh in another. This is made easier by the hauling of full trips of cars loaded with coal from either bed and by movable display signs notifying the dumpers of the location from which the coal is derived. A method of bookkeeping enables the company to trace their

APPROXIMATE RELATIVE POSITION AND AVERAGE THICKNESS OF THE COAL BEDS OF MARYLAND

	Beds	Average Thickness	Perpendicular Distance
Dunkard Formation	Jollytown	2 ft.	222 ft. 0 in.
	Washington	3½ ft.	48 ft. 6 in.
	Waynesburg "A"	2 ft.	46 ft. 4 in.
Monongahela Formation	Waynesburg or Koontz	3 ft. to 6 ft.	57 ft. 3 in.
	Uniontown	0 ft. to 1 ft.	63 ft. 4 in.
	Upper Sewickley or "Tyson"	3 ft. to 6 ft.	48 ft. 6 in.
	Lower Sewickley or "Tyson"	2 ft. 6 in.	48 ft. 10 in.
	Redstone	4 ft.	33 ft. 0 in.
	Pittsburgh or "Big Bed"	14 ft. to 18 ft.	75 ft. 8 in.
Conemaugh Formation	Little Pittsburgh or "Michaels"	2 ft.	93 ft. 0 in.
	Franklin, Little Clarksburg or "Dirty Ninefoot"	9 ft.	23 ft. 0 in.
	Lonaconing	2 ft.	86 ft. 6 in.
	Elklick	1 ft.	34 ft. 3 in.
	Friendsville	2 ft.	49 ft. 0 in.
	Maynardier	2 ft. to 3 ft.	40 ft. 6 in.
	Bakerstown, "Fourfoot" or "Threefoot"	2 ft. to 5 ft.	97 ft. 3 in.
	Brush Creek	2 ft.	87 ft. 10 in.
	Mahoning	2 ft.	48 ft. 2 in.
Allegheny Formation	Upper Freeport, "Rock Vein," "Threefoot" or "Fourfoot"	3 ft. to 6 ft.	54 ft. 7 in.
	Lower Freeport	2½ ft.	105 ft. 0 in.
	Upper Kittanning	1 ft. to 3½ ft.	45 ft. 10½ in.
	Middle and Lower Kittanning or "Sixfoot"	6 ft.	21 ft. 4 in.
	Split Six	3 ft. to 4 ft.	91 ft. 6 in.
	Clarion or "Railroad" Seam	2½ ft.	13 ft. 7½ in.
	Brookville or "Bluebaugh"	3 ft. to 6 ft.	33 ft. 1½ in.
Pottsville Formation	Upper Mercer, "Mt. Savage" or "Fireclay" bed	3 ft.	10 ft. 10 in.
	Lower Mercer	1 ft.	169 ft. 2 in.
	Quakertown	2 ft.	128 ft. 8 in.
	Upper Sharon	1 ft.	36 ft. 3 in.
	Lower Sharon	1 ft.	4 ft. 0 in.
	Mauch Chunk red shale		

mine cars so that months later any carload of coal can be traced back to the mine, the seam, the heading, and the room in which the coal was loaded and to the men who, together, loaded it. The Consolidated Coal Company used to analyze samples from every carload of Sewickley coal. But finding that the output was very regular, about ten samples are now taken in every mine every two, three or four months, so as to determine the uniformity of the coal shipped. Its excellence can be judged from the average analysis hereunder submitted:



BOX-CAR AND GONDOLA TIPPLES, EXHIBITING SIMPLICITY OF CONSTRUCTION

ANALYSIS OF UPPER SEWICKLEY COAL

Moisture	0.63 per cent.
Volatile matter	19.27 per cent.
Fixed carbon	73.88 per cent.
Ash (including sulphur)	6.20 per cent.
Sulphur	0.85 per cent.
Calorific value	14,570 B.t.u

The Lower Sewickley, mined only near the pumping shaft, is markedly like the upper bed, as the average analysis of eight samples shows:

ANALYSIS OF LOWER SEWICKLEY COAL

Moisture	0.66
Volatile matter	18.94
Fixed carbon	73.56
Ash (including sulphur)	6.84
Sulphur	1.14
Calorific value	14,547 B.t.u.

The coals below the Pittsburgh bed mostly run higher in sulphur than the Tyson beds or the Pittsburgh. But for general purposes they are good, having a calorific value of over 13,000 and frequently of over 14,000 British thermal units.

HAULING AND SURFACE APPLIANCES

The equipment of the Georges Creek region has marked individuality. As the mines have dips running from level up to 20 per cent., heavy hoisting equipments are installed. As the coal is thick, it has been possible to introduce heavy draft horses, but mules are also used, the proportion running about one mule to every two horses. There is a disposition to favor horses and even in the Tyson bed, which is thin, the use of stocky ponies is being advocated in place of mules, which, when short, are invariably too light. The horses appear to retain their health under somewhat unfavorable circumstances. The mines are not by any means dry and it has not been possible to avoid the presence of mud in the haulage roads. The live-stock haulage is everywhere subsidiary to that of the rope but in some places electric and compressed-air haulage are used.

VIEW AT STABLE, SHOWING EXCELLENT CONDITION OF MIXED STOCK

In order to put in a safe signaling system, the Consolidation Coal Company has in some places installed engines and dynamos running at an electric pressure of 110 volts. However, a stock of electric batteries is kept in charge in case the signaling dynamo should break down. The fans of the region are large and of slow-speed type, usually arranged for forcing air into the mines, set clear of the shafts or drifts they serve, but connected by fragile ducts, which on an explosion occurring would be blown to pieces, thus saving the fan. However, explosions are not to be expected; the coal is free from gas in the beds worked and there is enough water to keep the dusts from being explosive in character. Moreover, the low percentage of hydrocarbons makes the dusts less explosive.

The tipples are remarkably low and simple. They are not built for screening. No devices guard against the breakage of the coal, which seems to sell without regard to its physical condition. The preparation of the coal is all done within the mine. The excellence of this preparation is evidenced by the absence of any unsightly piles of bone coal along the railroad tracks.

MINING METHODS

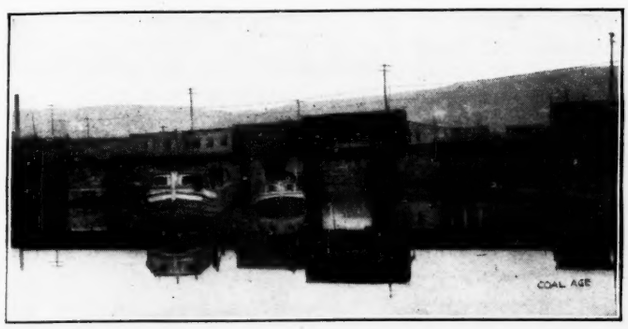
The Pittsburgh bed is frequently mined without shooting. Black blasting powder is used for almost all coal shots in the Big bed, whereas carbonite is used almost exclusively in the Sewickley and both dynamite and carbonite are employed to dislodge rock.

Another interesting feature is to be found in the large quantities of long props used to support the brittle roof. These are 9 or 10 ft. long and measure at least 4½ in. in diameter at the small end, and, if of soft wood, at least 5½ in.; reckoning only, of course, the diameter of the prop beneath the bark. These props are usually stacked on end. They frequently rot where they touch the ground and to protect them they are sometimes dumped indiscriminately and more rarely, laid in crossed piles to dry. They are not usually laid as in other fields after the manner of corded wood, in such a manner that air cannot circulate around them. Corded props rot freely along their full length. As the props cost from 14 to 15c. f.o.b. mine and serve for the extraction of an average of 3.3 tons, the propping of the roof consequently

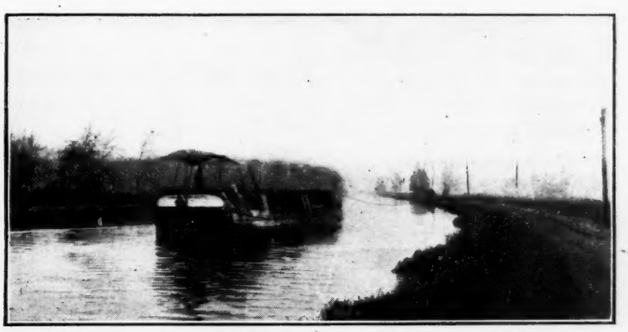
consumes no less than 4½c. of the tonnage cost of the coal. In the Tyson bed, long posts are used, being cut to size in the mine as required.

Some attempt has been made by the Consolidation Coal Company to recover salvage rate will be. Some permanent timbering has been creosoted.

There is but little machine digging; only 44 machine-pick diggers and 3 electric chain machines being installed in the whole district. They are used wholly in 100-ft. centers. Roads are laid in the crosscuts. This manner of driving the rooms, together with the absence of gas makes it possible to work several men in a single room, some working at the breast and some in the very lengthy crosscuts



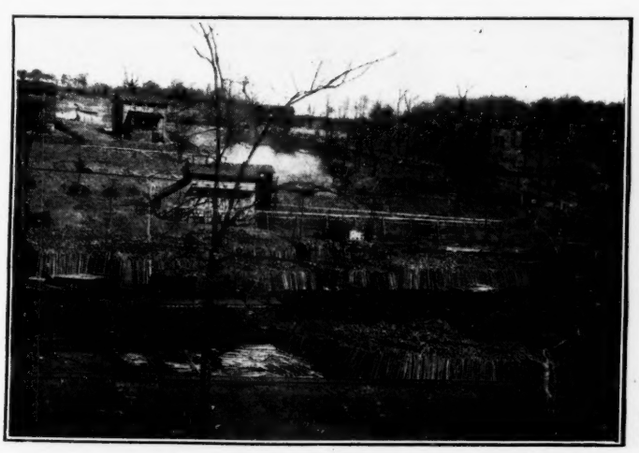
DUMPING COAL FROM THE C. & P. R. R. IN BARGES



BARGES LOADED WITH COAL ON CUMBERLAND CANAL

PROP YARD IN GEORGES CREEK REGION

THE ROOF BEING FISSURED DEMANDS MUCH TIMBER



PROPS ARE, FOR THE MOST PART, SHIPPED IN BY RAIL

THE TIMBER IS USUALLY STORED ON END TO PREVENT ROTTING

the timber used to support chamber roofs, but it cannot be considered successful. Perhaps the proportion recovered does not exceed 8 per cent. The amount drawn from the newly opened Tyson longwall may prove quite large but it is premature to anticipate what the heading and room driving and not in "pillaring" as pillar robbing is here termed.

ROOMS ARE QUITE NARROW

The method of mining now in use is by a series of rooms 15 ft. wide, placed at between the rooms. The nature of the normal projection can be clearly seen in the illustration. It is remarkable that in this—one of the oldest mining sections in the United States—there is the least evidence of the loose-ended wastefulness in operation found in nearly all

coalfields, especially in the older ones. The mines are models of uptodate conservation in a field worked by miners, who brought up to wasteful methods, must have resisted lining up to the more conservative methods of mining.

The Tyson bed is largely worked as subsidiary to the Big bed below, the coal being run to the Big bed track by chutes, either in the mine or outside. These chutes are arranged to have such an excessive fall that storage is provided in them. Thus the coal arrives from the chutes in the large cars used in the Big bed. About 9 per cent. of the coal mined in the Georges Creek region is transported by the South Cumberland canal, to which it is hauled by the Cumberland & Pennsylvania railroad.

Toward the southern part of the field, now almost entirely worked out, long gravity planes were used for lowering loads of coal and raising empty cars. But these have given place to long engine hoists hauling coal out of steeply inclined slopeways to tipples on the level of the outcropping measures, situated on the flanks of the field.

Miners Are a Superior Class

The coal of this field is worked entirely by miners, who are the descendants of the English, Scotch and Welsh miners who immigrated here many years past. It is entirely a nonunion field, but considering the thickness of the coal and the ease with which it is mined the rate of 63c. per long ton is eminently fair. The Consolidation Coal Company has no company houses but owns nearly all the land on which the employees live. Any employee can lease for $2 to $5 a year enough land for a home with a liberal curtilege for truck farming. This lease lasts five years. If the company does not desire to renew the contract, it pays for all improvements at its own price or at a price to be determined by arbitrators chosen by the company and the tenant and by a third arbritrator chosen by the other two. If the tenant is still not satisfied, the terms of the lease permit him to appeal to the county courts. The houses built on this leasing system are not lined up simply in serried rows of uniform plan and color, but are designed and placed to suit the whims of the many owners; they are kept clean and orderly, the tenants delighting in cultivating the pretty flower gardens with which, in nearly every case, the fronts of the houses are graced.

I desire to express my acknowledgments to H. V. Hesse, general manager, and R. A. Walter, chief engineer, of the Consolidation Coal Company, from whom much of this information was derived.

Don't use discharge pipes or water pipes of any kind for air lines if it can be avoided. The scale will block the air ports. If so used, the scale should first be loosened or blown out thoroughly.

Developing a New Field in Iowa

By Carl Scholz.*

Through the construction of a line from Des Moines to Allerton, 68 miles south, the Rock Island Railway is developing the largest unworked coal area in Iowa and what appears from the drilling to be the most compact body of clean coal that ever existed in the State. A conservative estimate indicates that at least 200,000,000 tons of coal, lying less than 400 ft. below the surface, will be available for transportation.

The only reason for delay in this development was the high cost of railroad construction. The new line, in connection with the recent purchase of the St. Paul & Des Moines Railroad by the Rock Island, will result in a considerable coal development near the southern end of the new line. This link will connect the coal mines with a very desirable market on the northern end, where Mason City, with its two cement plants and a number of tile and clay industries, is a large and steady consumer of coal.

One of the important developments in this coalfield has been started by the Consolidated Indiana Coal Company, which holds about 4500 acres of valuable coal land in this field.

Development to Be Finished Next Spring.

The construction on shaft No. 1 has been started, so that the mine development will be complete by the time the rails reach the new properties next spring.

Shaft No. 1 is located about 2 miles south of Dallas or 35 miles south of Des Moines. The mine yard will parallel the main track and will have a capacity of 75 loads and empties. Scales will be provided at both ends of the yard to weigh empties before loading; it is also the intention of the company to weigh the loaded cars before they are switched to the north or south bound track.

The tipple will be of steel, equipped with screens to make four sizes of coal. There is a storage bin of 400-tons capacity, so located as to permit the loading of the smaller sizes of coal from this bin into box cars. A separate box-car loader will be installed for the loading of lump coal.

All buildings will be of steel and fireproof construction. It is now planned to install an electric hoist which will be automatic in operation once the starting lever is put in the proper position. The acceleration, slow down and stop will be entirely automatic, including the dumping operation. While it may seem unusual to provide for electric hoisting at a mine where steam is generated, the saving in wages and fuel, the better control of dumping, and the absence of risk from over-winding justifies the installation of such a plant.

A 500-kw. generator furnishes the power for the hoist and the other motors, including power for haulage and undercutting.

Shaft Lined with Reinforced Concrete Frame

The shaft will be lined with a reinforced concrete frame of a new design on which a patent has been granted. This shaft lining, including the concreting and steel guides, costs about 15 per cent. more than the ordinary wood lining. The shaft has a depth of 175 feet.

The second outlet to the mine is a slope on a pitch of 1 to ¾. It will be timbered with steel beams and divided in the center with an air-tight partition; one side will be used as a travelingway and the other for the airway. Underground workings are planned for a capacity of 2000 tons per day.

A machine shop will be provided for the necessary repairs and a bath-house will enable employees to change their clothing before entering the mine and upon their return to daylight.

On account of the distance from any settlements, the coal company will erect a mining town for the convenience of its employees.

*President, Rock Island Coal Company, La-Salle street station, Chicago, Ill.

Mine Rollers

A rope roller which will not roll is worse than none at all. Where the grade is steep and even, a rope will not wear the ties appreciably when the rollers are omitted. On a 24-per cent. grade, it has been noted that where the grade was even, ties remained intact. But trifling deviations in grade resulted in the grooving of the ties.

If the grade is lower than or conforms to the shape which a rope suspended between the top of the hill and the first car would assume at a normal tension, the rope will not wear on the ties at all. Sometimes it would be well to so adjust a rope-grade. Such a plane would give a quick getaway, and a slackening pull at the end of the run. This, in the case of a gravity plane, is better than an even grade, especially if the change in slope is carefully calculated, so as to make the change regular, with no sudden alteration in grade at any point.

Grades in timber entries should be duly considered. If wood rollers are used, the stalling of a roller while the rope is running may cause a mine fire. The same may be caused by the rope running on a tie. The only safe plan is to arrange that the rope is evenly supported by the ties or the rollers, and iron rollers should be used in every case.

Government Regulation of Coal Prices

By John H. Jones*

It is suggested that much good would result from establishing a maximum and a minimum price at which coal can be sold, and then basing the miner's wages on the selling price. It is also advocated that a law be passed taxing all the coal mines in the United States, so as to provide for the families of miners who are killed.

*President, Pittsburg-Buffalo Coal Company, Pittsburg, Penn.

When we realize that during the past 50 years, the production of coal in the United States has increased from 15,000,000 to 500,000,000 tons, we will wonder how it has been possible to make such phenomenal progress.

There is a saying in the coal business that it is either a "feast or a famine." The coal man is either a prince or a pauper, but taking everything into consideration, say for a period of 10 years, a well managed coal company is able to show a fair average earning capacity.

One bad feature of the industry is, that when there is plenty of money in the business and the prices are abnormal, many inexperienced people start mining coal. This brings about a reaction and extremely low prices.

Coal Profits Have Varied

During the past decade, the profit on a ton of coal has varied all the way from nothing to five dollars. When the prices are high, some coal companies try to make every dollar they can, and get out every pound of coal that can be produced, regardless of the safety of the men employed in the mines. When they are not making money, or, in fact, losing money, it is absolutely impossible for the operator to spend the necessary amount to make his mines as safe as they should be.

A Maximum and a Minimum Price

In view of this situation, would it not be better to have Governmental regulation in the selling price of coal, establishing a maximum and a minimum price at which it could be sold, and basing the miners' wages on the selling price? Make the minimum price of coal high enough to permit the producer of coal to use every means known to prevent accidents and conserve coal.

If it was shown to the buyer of coal that every cent, below a reasonable price paid for coal, was stained with the blood of some poor miner, and thereby robbed the widows and orphans of the proper means of sustenance, as well as the means of educating their children, I do not believe that they would try to break the price, as a certain big railroad did a few months ago by securing their coal for five cents a ton less, which means a loss to the operators of this country of more money than the total amount they receive from this company for coal.

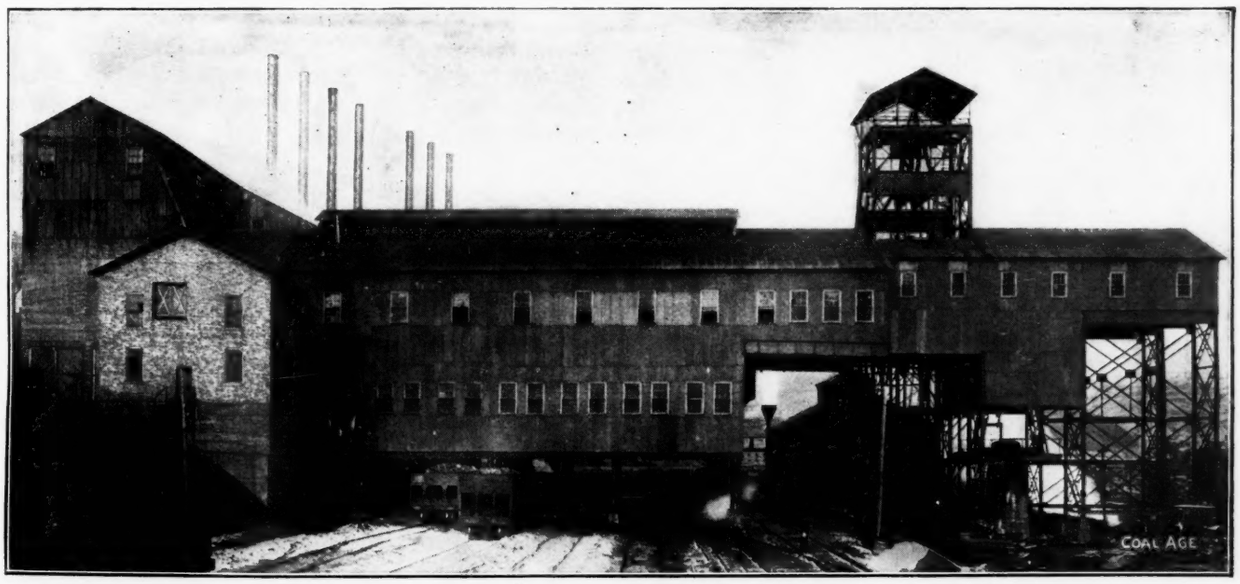
A Law Taxing All Coal Mines

I also believe that a law should be passed, taxing all the coal mines in the United States, which money should be administered for the purpose of paying, to the miner's family, a sum equal to the wages he would receive, in case of his death in or around the mines, or to pay his regular wages, in case of an accident which would prevent him from earning a livelihood thereafter.

There is no more horrible fear, to a miner, than the fear of an accident after he goes down into the mine, and the further fear that his wife and children may be left without means of support, and that his children, in all probability, will not receive the education they should have. This is a serious question and one that should be carefully weighed by all of our legislators.

A Law for the Regulation of the Industry

A proper law for the regulation of the selling of coal, and a proper law for the administration of a fund to take care of the miner, himself, in case of an accident which would disable him, temporarily or permanently, or in case of fatal accident, care for his widow and orphans, will eliminate many of the anxieties of the business, and will do justice to the miners, the operators, and to the public generally.



A New View of the Marianna Tipple and Washer. This Plant Is the Pride of the Pittsburg-Buffalo Coal Company and Is Probably the Most Modern Coal Installation in America. The Equipment and Preliminary Development Work at Marianna Cost More Than $1,000,000

Gas Producer Development

Near Saarbrücken, Germany, there is a gas-producer plant which is operated on mine refuse, containing only 20 per cent. of good coal and averaging over 60 per cent. ash. The fuel used is composed largely of roof slabs from a local bituminous mine.

The generators are of the type known as the Jahns "ring" producer. This producer is characterized by having several combustion chambers, which come successively into operation as gas generators after a preparatory period of gas expulsion and distillation. Furthermore, the arrangement is such that the products of distillation have to pass through large beds of highly incandescent fuel on their way to the gas main, so that the power gas contains only such tar vapors as do not decompose in contact with the glowing coal, and which can therefore be considered as permanent.

Fig. 1 shows a plan and sectional elevation of a "ring" producer having four chambers, each of which can be connected with the main at will. Each chamber is also joined at top and bottom through the passages *B* and *C*, respectively, with the vertical flue *A* at the intersection of the partition walls. The passages *B* and *C* can be opened and closed separately. One or more chambers may be in the gasification stage, and therefore connected with the main, at the same time. The remaining chambers, which are in preparation, discharge through the passages *B* into the flue *A*, and thence through the passages *C* into or under the combustion zone of the producing chambers. Circulation is aided by a steam injector in the upper part of the passage *A*, and the gas is drawn off by means of an exhauster and passed through a scrubber and sawdust cleaner. The gas obtained at the Saarbrücken plant is used under steam boilers and in gas engines. No trouble is experienced with the engines, of which there are about 1800 h.p. in use.

A Producer Burning Lignite

Another form of producer, interesting because of its possible bearing on American needs and development, is the small double-zone suction type in common use through Germany for burning brown-coal briquets. This brown coal closely corresponds to some varieties of American lignite.

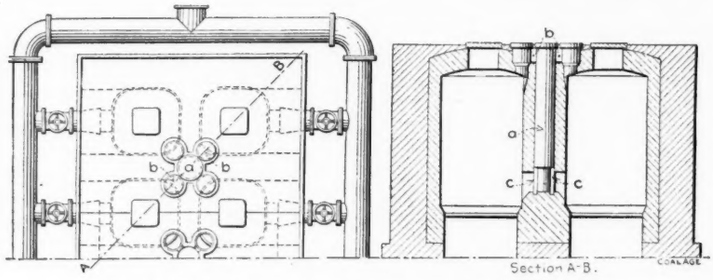


Fig. 1. Plan and Sectional Elevation of "Ring" Producer

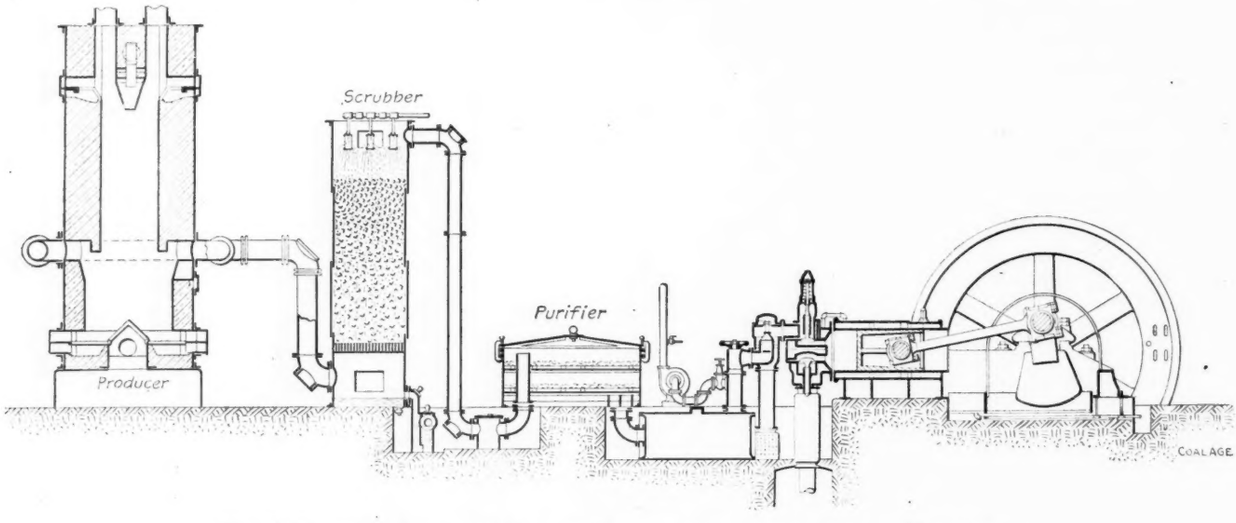


Fig. 2. Showing Sectional View of Double-zone Suction Type of Producer

A sectional view of such a plant is shown in Fig. 2. The gas is taken off from a point about midway in the hight of the producer and the fire burns from both top and bottom toward the central zone. Air for combustion is admitted through the charging hopper and also through the ash-pit, if necessary. These plants require but little attention beyond filling the hoppers; possibly less than the average producer using anthracite.

A plant of this description is located at Fürstenburg, about a mile from a large brown-coal mine. The coal, which contains approximately 55 per cent. water as it comes from the mine, is ground, dried to a moisture content of 11 to 14 per cent., and briquetted without using a binder. The entire output of the mine is used in this way and the gas obtained drives gas engines for generating electric power.

Note—Abstract from Bulletin No. 4 of the U. S. Bureau of Mines, entitled, "Features of Producer Gas Power Plant Development in Europe," by R. H. Fernald.

Painting Mine Survey Stations

The indistinctness with which engineers' centers and bench marks are painted on the roof and ribs in coal mines, would largely be corrected were slaked lime used in place of white lead as a pigment. The lime must be well slaked or it will burn the brush. The objections to lime are the greater weight to be carried and the change of condition, which takes place as it begins to set, often changing a too liquid mixture to one that is too stiff. These are the advantages: A legible mark of an intense white which will last for years, which is scarcely dimmed by smoke, and the use of a material which can be found in almost any plant and which costs but little. Some people prefer to add salt to the water in which the lime is slaked. Whiting does not appear to be preferable to lime. If possible, it would be well to repaint the lime marks after a few minutes' time have elapsed, with the idea of making them more strong and more prominent, but this is not by any means necessary.

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CIRCULATION STATEMENT

Of this, the first issue of COAL AGE, *we will print 5000 copies. No copies will be sent free regularly. There will be no back numbers. The figures which will be shown here each week will represent live, net circulation.*

This journal is interested solely in matters relating to the fuel industries, and is designed to be a medium for the free interchange of ideas, the detailed description of coal-mining practice, and the expression of independent thought calculated to benefit both operator and miner.

Contents

COAL AGE

Looking Ahead

A machine works best after some use when the individual parts fit snug. It is likewise true in the case of COAL AGE—we will give you a broader, better paper as we go along. Do not interpret this as an apology for the present or any early issue, but rather consider it a promise to provide a coal journal that will set its own standards and never be content to measure up by what others have done.

Coal men do not write as often or as much as those engaged in other industries. Our idea is to cultivate your taste along this line, and encourage you to discuss the problems that confront the industry at large. No effort spent in this work will be wasted, for it is one field where you reap in full proportion to what you sow.

There are men who pride themselves on their ability to maintain unbroken silence; they look wise and say, "I never talk!" What would happen if we all followed this same plan? Where did they get their basic information? The laws of gravity, the principles of electricity, and in fact, all science would be "Greek" to them if the great minds of the past had been so indifferent to the advancement of knowledge.

Reverting to this initial issue of COAL AGE and the numbers that are soon to follow, you will observe that practically all of the matter published has been prepared exclusively for us. The first of Mr. Conner's articles, comparing anthracite and bituminous mining methods, is on another page. No engineer in America has had a more extended experience in the two main classes of coal mining, and we are sure that all our readers who follow his remarks will be benefited.

These articles by Mr. Conner form only one series of many that have already been arranged for: Electricity in coal mining; safety precautions; mine explosions; mechanical ventilators; mining machinery; preparation of coal, and various phases of general mining practice are subjects that will be handled immediately in great detail.

Perhaps the most valuable feature of COAL AGE during this first year will be the descriptive articles dealing with operations in each of the important fields in America and Europe. Unless crowded out by something more urgent, one of these articles will appear each week. The first of the series, that published in this initial issue, describes the Georges Creek region in Maryland. This field is one of the oldest in America, and is well suited as a leader. In some instances these general articles will be prepared by members of our editorial staff; however, present arrangements indicate that the greater number of these local descriptions will be written by well known engineers identified with active practice in the particular field described.

We might fill a page here outlining our plans, but we know that you want the realization, not the anticipation. The beginning of your realization is the paper here before you. Much in the way of style and scope has been reserved for the issues immediately succeeding; we want to please you and we have our ears to the ground, listening for any suggestions that you will be kind enough to make.

Reciprocity in Coal

Canada's refusal to sustain the Laurier government in its reciprocity arrangement with the United States must be regarded as the outcome of a complex series of factors. Not only the economic side of the agreement, but also many purely political influences were at work to produce the result. The trade aspects of reciprocity were, therefore, by no means the only ones that led to its defeat. Nevertheless they had their effect, and the coal question was probably as influential as any in turning opinion against the agreement. Particularly in Nova Scotia and the Northwest did this issue figure.

The agreement with Canada provided for the admission of American bituminous coal, such as would not pass through a three-quarter-inch screen, into Canada at 45c. per ton, while Canadian coal, slack or culm, such as would pass

through a half-inch screen was to be admitted to the United States at a 15c. rate. The change proposed was certainly not extreme. The existing rate on American coal entering Canada was only 53c., while imports for last year were about 5,700,000 tons and yielded $3,000,000 of customs duties.

It was estimated that the amount of duties remitted under the arrangement would be only about $450,000. As for the Canadian coal to be admitted to the United States, the change proposed was trifling and would not have altered existing conditions of competitoin largely. Why this moderate alteration in duties on either side should have aroused opposition is not easy to understand, but reference was made to it not only in the sections of Canada which produce coal, but elsewhere.

The real cause of the difficulty appears to have been found in the belief that a change in rates would lead to an alteration in the distribution of freight. Canadian railroad managers were almost morbid in their fear that changes in the tariff would result in diverting the carrying trade from an east and west line into north and south channels, thereby giving business to American shipping on the Great Lakes and the coast as well as to American roads connecting with Canadian points, at the expense of Canadian transportation lines.

In the case of coal, as in that of other commodities, it was apparent that the consuming public of Canada was desirous that the advantages of reciprocity should be realized. The reciprocity arrangement would have tended to cut the rates for coal to some extent at quite a number of points, or at all events would have operated to restrict the control of the market by local dealers. Prices are high in Canada for nearly all consumable goods, and there were many persons who regarded the reciprocity arrangement as essentially a plan to admit cheaper articles from a country where they could be more easily produced.

This was a curious parallel to the similar point of view which existed in many parts of the United States. It is not likely that the reductions made in the agreement either on coal or other articles would have altered prices much, but Canadians saw that the natural tendency of the reciprocity undertaking would have been toward a still freer interchange under the terms of other agreements that might be negotiated later on. "Unrestricted reciprocity," which Sir Wilfred Laurier frankly said had been asked for by the United States on a list of articles including the products of mines, was feared by them as a possibility.

This fear is one that is undoubtedly likely to be warranted by future events. Influenced as it was by the extraneous factors already referred to, the Canadian election cannot be accepted as a truthful indication of Canada's attitude toward closer trade with this country. Canada needs to admit our coal and other mine products at many points along the border at lower tariff rates as much as we need to admit hers.

There is reason to believe that the defeat of reciprocity will prove to have been only a temporary check in the development of trade relations between the two countries, though the election results may defer closer commercial union for a considerable time.

Pollution of Mine Waters

The Health Laws of the State of Pennsylvania expressly exempt the waste from mines and tanneries from restrictive legislation. It has been found on bacteriological examination by the Department of Health of that State that the bacillus typhosus (the bacillus of typhoid), the bacillus anthracis (that of anthrax), and the bacillus coli (the amiable bacillus inhabiting the colon) are destroyed by infusions of mine water. It may be that the presence of hydric and ferric sulphates in the waters of the mining regions of Pennsylvania gives the inhabitants of those regions their recognized relative immunity from consumption.

It is well to recognize that the redness of mine water is not at all due to the presence of sulphuric acid, which is almost colorless. Streams are not, as is often stated, "red with sulphur." The impurity which reddens the creeks and coats the rocks and which has a characteristic ocherous color, is ferric hydrate.

The iron pyrites, in the presence of oxygen and water, break up into ferric hydrate and hydric sulphate. The former is quite harmless; the U. S. Bureau of Agriculture in a recent bulletin terming it a fertilizer. Even unneutralized by earthy oxides, the sulphuric acid is not wholly harmful. Free sulphuric acid, as also free sulphur, has been used as a fertilizing agent and has value when the soil is deficient in such elements. The presence of limestone causes the sulphuric acid to turn to calcium sulphate or gypsum, which is harmless to vegetation. So that in small quantities, as can well be seen, the sulphuric acid and ferric sulphate work no harm to the farmer and are not undesirable components of such river water as is not being used for drinking or washing purposes, and may serve in some quantities to make waters, otherwise dangerous, safe.

And indeed, sulphur is an essential constituent of albumen, to be found in the cells of all plants, and it appears to have been present as part of vegetable life from Paleozic ages to the present. The extent to which it is so found is not well understood. It is customary in most chemical analyses to heat to desiccation and to treat the elements and compounds driven off before the analysis is taken, as water vapor. In this action, volatile sulphur passes off. Emil Wolff, who has made investigations into the sulphur contained in vegetation, has thrown considerable doubt on the accuracy of his results, by the method of analysis which he employed, because he took no account of sulphur volatilized at low temperatures.

Certain greenish weeds seem to prefer sulphuric waters as a habitat, and all vegetation seems able to sustain life, with a certain percentage of sulphuric acid in the water it imbibes. The water receives a treatment by this infusion of mine waters similar to that frequently employed in purifying plants.

There are places, it is true, where an excess of either sulphuric acid or ferric hydrate appears to have killed vegetation, and where trees have rotted as a result of the injury which has been done to them by its presence. Many trees near mines are killed, by sulphurous fumes, or by the deep burying of their roots in mine refuse. However, some have died and later rotted as a direct result of mine water. On the other hand, the fertility of the banks of the Monongahela, between Clarksburg and Fairmont, W. Va., bears witness to the fact that quite a large amount of mine water does not injure vegetation; otherwise the little grassy islands in polluted portions of the river would not be so universally apparent.

COLLIERY NOTES and COMMENTS

Practical Hints Gathered Here and There, and Condensed to Suit the Busy Reader

A mine fire in the Panther Creek Valley region, Pennsylvania, burned for over fifty years before it was successfully combated.

When an exceptionally high temperature is found at any part of a road through a gob, everything else being in order, and ventilation as usual, look at once for a gob fire.

When laying out a haulageroad see that it is driven as straight as possible. When it is necessary to change the direction, use long radii curves, also connect cross headings with easy curves.

The best and most serviceable form of air bridge is that cut in the solid. The first cost is somewhat high, but experience has shown that this form is best adapted to withstand the force of explosions. It is self-supporting, costs little for repairs and can be easily enlarged at small additional cost.

Experience has shown that one of the greatest aids to power-plant economy is the frequent and systematic analysis of the flue gases given off by the boilers. The quantity of carbon monoxide, oxygen and carbon dioxide tell accurately the quality and quantity of work being done by the boilers and the coal.

Some of the requirements for breaker machinery are: 1. Simplicity of construction, so that experts are not needed to run it. 2. Reliability. 3. Construction with interchangeable parts so that expensive duplicate machinery need not be kept on hand. 4. Rigidity of construction in order to withstand shocks.

Relative humidity means the quantity of moisture in the air as compared with the quantity held in suspension when the air is saturated. This relation is expressed as a percentage. When air is saturated the relative humidity is 100 per cent. Temperature decides the amount of moisture necessary to saturate air.

The new Mineral Spring breaker of the Lehigh Valley Coal Company, at Parsons, Penn., is built entirely of steel, concrete, corrugated iron and glass. The frame is of steel; the foundation of concrete; 1,169,000 lb. of steel were used in its construction. Another unusual feature is its large amount of window area. It has a capacity of 1500 tons of coal per day, and can be operated by 35 men.

If a gob fire is small and easily accessible, dig it out and send it to the surface in iron cars. If too large for such treatment, the gob must be sealed and the fire choked by lack of oxygen. To do this, erect brick stoppings tightly packed with sand. First, build a stopping in the return, and fit it out with a pipe and tap so that the gas may be run off if necessary. Next build the intake stopping, thus sealing the gob tightly and smothering the fire.

When tamping holes for electric firing, take great care not to cut the wire or damage its covering. Allow 8 in. of wire for each connection. Many an otherwise successful shot has been spoiled by carelessness in this direction. See that you have clean wire ends, free from covering, with which to make connections. If they do not seem bright, rub with a knife or stone, then twist firmly. Never loop the wires. Never allow uncovered joints to touch the ground.

Where the object is to obtain as pure a coal as possible, all loading in the mines should be done by hand, as this allows for the removal of most of the impurities at the working face, while chute loading sends out a dirty coal, because everything brought down by the blast is necessarily loaded out. Hand-loaded coal in clean anthracite veins sometimes sizes as high as 2.3 tons per 100 cu.ft. of mine-car capacity, while chute-loaded run-of-mine often runs as low as 1.2 tons.

Investigations made by the Bureau of Mines have shown that the relative humidity of the main-return air current of a mine is nearly always over 90 per cent., no matter what the relative humidity of the outside air may be. The average relative humidity in the returns of various coal mines was found to be 90.5 per cent. A lower humidity was found in the Rocky Mountain region where the air outside the mines is uniformly dry most of the time.

When furnaces are well adapted to the kind of coal to be burned there will be little loss of combustible gas. The efficiency of combustion of the volatile matter in coal depends on the kind of furnace used. With a poor furnace and poor firing an 18 per cent. volatile coal may give results ten or twelve per cent. higher than a 30 per cent. volatile coal. The presence of ash in coal lowers the heating capacity of the combustible by interfering with the circulation of air through the fuel and by loss of heat while fires are being cleaned.

An ordinary miner's lamp will go out in the presence of a small amount of carbon dioxide, if the oxygen of the air is reduced to as low as 17½ per cent. In cases where a mine is sealed up to extinguish a fire, if the sealing is sufficiently tight, the oxygen is soon reduced below this figure; but if the sealing is not tight, the fire may smoulder on, until the opening of the mine brings a fresh supply of oxygen and it then breaks out again. The only reliable data on which to decide the time for opening a sealed mine is that furnished by careful analyses of the mine gases.

To insure the comparatively safe robbing of pillars the following points should be observed: 1. Make all skips as short as possible. 2. Do not allow skips to meet. 3. Keep all skips regular and not too wide. 4. Take out the timbering as soon as possible after the skips are finished. 5. Use an abundance of timbering. 6. Avoid a multiplicity of small pillars or small skips finishing simultaneously. 7. Guard against heavy falls, which are apt to send accumulations of firedamp out into the roadways. 8. Use only safety lamps. 9. Employ only the most experienced and trustworthy men for the drawing of timbers.

The stone-dust method of laying dust in coal mines consists in throwing finely crushed shale dust on the ribs and timbers of passageways and scattering it over the floor. Wherever coal dust is visible, more shale is thrown on. It is also placed on boards fastened to the timbers over roadways, and on swinging canvas shelves. The dust so placed is thrown into the air at each blast and extinguishes the flame. This method is especially recommended for mines where it is not advisable to wet the roof, or in coalfields where water is scarce. The longwall field of northern Illinois, where the floor is composed of shale which is constantly rising and falling in small quantities, thus covering the coal dust, has not had an explosion in 40 years. In Colorado and New Mexico adobe dust and sand are used in place of shale.

INQUIRIES of GENERAL INTEREST

A Page Devoted to Those who want Information. All Questions must be Accompanied by the Name and Address of Inquirer

Motor Haulage

What weight of motor will be required to haul a trip of ten cars, carrying a load of three tons each up a grade, assuming a coefficient of friction of 0.03 and a coefficient of traction of 0.18, the tangent of the angle of inclination of the track being 0.02619?

ANTHRACITE.

The contents of 10 cars weigh 10 × 6,000 lb. = 60,000 lb. The 10 empty cars are assumed to weigh 10 × 2000 lb. = 20,000 lb. The gross weight, therefore, is 80,000 lb. Now the tangent of angle of inclination of track = 0.02619; hence the angle as deduced from the tables is 1 deg. 30 min.

The frictional coefficient is always figured as a percentage of the weight of the body when on a level. When running vertically the friction will be zero because the wheels will not revolve or slide on the track. Intermediately the friction will equal the product of the weight of the body together with the frictional coefficient and the cosine of the slope.

Consequently the frictional resistance of the cars will equal 80,000 × 0.03 × cos. 1 deg. 30 min. Cos. 1 deg. 30 min. equals 0.99966, so that the resistance of the cars equals 2399.2 pounds.

The drawbar pull needed for the elevation of the cars without regard to friction equals the weight of the cars multiplied by sin. 1 deg. 30 min.; or equals 80,000 × 0.02618 (for sin. 1 deg. 30 min. = 0.02618) = 2094.40 pounds.

But if the motor weighs W lb., being on the same grade, it will have a resistance to downward motion to overcome equal to $W \times$ sin. 1 deg. 30 min. $= W \times$ 0.02618 lb. Adding up resistances, we have, $2399.2 + 2094.4 + W \times 0.02618 = 4493.6 + W \times 0.02618$.

We have assumed that the tractional coefficient given is the excess coefficient of traction after allowance has been made for the friction of the motor itself, running on a level. It must be remembered that whatever journal or other friction the motor may have, is taken up by the electrical power and does not effect in any way the tractional ability of the engine so far as adhesion to the rails is concerned. The frictional coefficient of the motor conceived as a tractive engine is but small compared with the whole friction of the motor considered as a power engine and its self-resistance to its own traction is solely a track- and not a track- and journal-resistance as in the case of the cars.

To overcome these resistances there is the friction of the motor on the rails. The coefficient of resistance is reduced in proportion to the cosine of the angle of inclination and is therefore 0.18 × 0.99966 = 0.17994; therefore, the tractive pull will equal $0.17994W$. Hence, $0.17994W = 4493.6 + 0.02618W$.

Therefore, $0.15376W = 4493.6$, or W = 29,224 lb., about 14½ tons.

It would seem that 15 tons would be an amply heavy motor because the tractive coefficient given is low for a sanded mine-rail, and the rolling friction of the equipment is almost twice what it should be, and it is assumed that the weight is being calculated for the maximum grade the motor will have to climb. The tractive coefficient is usually taken at 0.25.

On easy grades it is customary to assume that the frictional and tractional coefficients are unaffected by the grade and that the gravitational resistance equals the weight of the train and motor multiplied by the tangent of track inclination; the sine and tangent for small angles being nearly equal; therefore a short solution for this same problem is as follows:

The frictional resistance of motor and cars weighing in all $80,000 + W$, $= (80,000 + W) \times 0.03$ lb. The gravitational resistance $= 80,000 \times 0.02619$ lb. The traction $= W \times 0.18$ pounds.

Therefore, $W \times 0.18 = (80,000 + W) \times 0.03 + 80,000 \times 0.02619$.

Therefore, $W \times 0.15 = 4495.2$. $W =$ 29,968 lb. It will be seen that the short solution for a low-grade serves every practical purpose.

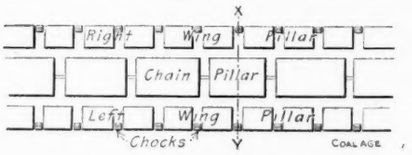
Prevention of Squeeze

If a butt-heading, from which rooms have been driven and the pillars drawn, is under squeeze and it is considered advisable to support the same with chocks, where should these be set, and why?

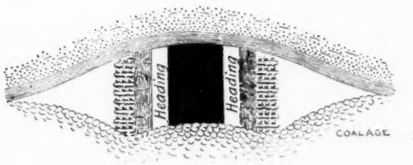
FOREMAN.

The chocks should be placed, as far as is possible, in all the necks of the rooms, over which the squeeze has traveled. They should be placed so that the outer edges of the chocks are flush with the breaking edge of the wing pillar, as in the accompanying figure. There are several reasons for this being a preferred arrangement.

1. There is more movement of the roof and floor and more compression at the breaking edge of the pillar than anywhere else, so that (a) the chock is more surely brought into action (for a chock cannot be driven so tight that it will uphold the roof when it is first put in, and the sustaining strength becomes greater the more the chock is squeezed); (b) the chock is put at a point where it can aid the pillar in the most effectual manner. If the pillar is not thus aided, its edges will be broken; their power for resistance being thus destroyed, the rest of the pillar will be more heavily burdened. The squeeze will move forward from the edge to the heart of the pillar. The placing of the chock should be such as to preserve all the powers of resistance of the coal. A squeeze usually advances by crushing off the edges continuously till the pillar is so much reduced that it can no longer offer an effectual resistance.



PROTECTION AGAINST SQUEEZE



CROSS-SECTION ALONG XY

2. When the chocks are so disposed, there will be no difficulty in finding an opportunity of building other chocks should they be needed. If set near the heading, further chocking cannot be attempted without removing a portion of the rib.

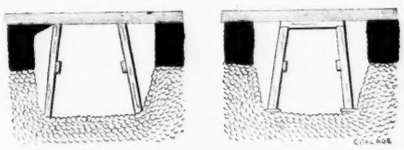
3. The arrangement of chocks shown furnishes an opportunity to inspect the progress of the squeeze, to determine its menace to workings on the advance and to point out the need of further reinforcement.

The accompanying figure shows a section *XY* across the wing and chain pillars in the above plan, with all the dimensions enlarged. The major enlargement of dimensions is in the vertical direction so as to make the curvatures and resultant inequalities of pressure the more manifest.

Post Setting in a Squeezed Heading

It is purposed to place lines of posts along the sides of a heading subjected to squeeze. What precautions should be taken in setting the posts when the underclay is soft? R. F. W.

Ans.—The posts should be set slightly leaning toward the center of the haulway (1 ft. in 12 ft. or 1 ft. in 16 ft.); so that when the underclay is squeezed out from beneath the coal, the post will be forced into a more nearly vertical position. If the squeeze is quite severe, both wing and chain pillars will be affected and the posts should slope toward one another from the opposing sides of the heading. Where this is not attended to, the push of the clay on the post or its flow beneath it, soon loosens it, so that it falls back against the rib. Should the pressure be considerable, the use of a notched cap is to be commended.



POSTING IN CREEPING HEADINGS

Occasions have occurred when all the heading posts, originally set truly vertical, have been upset by reason of an increase in squeeze, so that it was finally necessary to remove them. Inasmuch as such posts are likely to be knocked down by a derailed trip, if set in a haulageway, it is necessary to spike a plank from post to post, at the level of the widest measurement of the car used for carriage of coal or rock. It must be remembered that a squeeze by disturbing the track is liable to make derailments frequent. (See illustration above.)

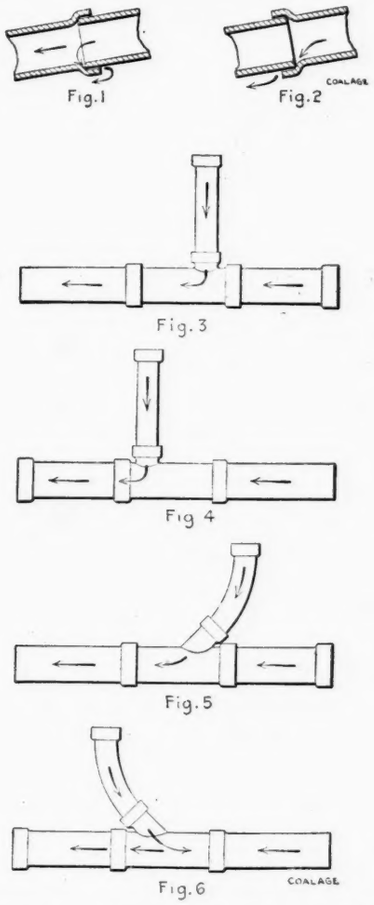
Sewer Pipe Laying

In the laying of sewer pipe, which end of the pipe should be up-grade and why?

M. E. B.

Should there be any leakage at the joints of a sewer line either through the cement-mortar or in the breaks, due to inefficient cementing, or because the sewer has been laid without filling the joints, those leaks will be of least consequence if the bells are turned upward, because the flow of water will not be toward the bell, and the water will have to pass upward to get out of the line. Should any water be passing through the ditch during the laying of the pipe, this water will be apt to wash out the cement if the bells are turned down-grade, favoring the escape of the liquid.

It will be noted that all sewer pipe "specials," wyes, tees, double-wyes, and crosses have bells on the branch lines. These bells would have to be broken off, should it be decided to reverse the accepted method of tile-laying when the branch is being laid. For it can be seen in the illustration, that however the main line may be jointed, the segments of the branch must have their bells uphill unless the first bell is broken off, for it points in that direction. All the wyes have their branches leading away from the bell of the straight line. If the bell on that line is downhill, those wyes must lead uphill, for they lead in the opposite



RIGHT AND WRONG WAYS OF LAYING TILE

direction to the position of bell on the main. Therefore water traveling in the branch will actually have to enter the main, when a standard wye is used, in the opposite direction to that of the water of the main channel, if the bells are clumsily disposed downhill. Where branches are to be provided, this latter argument is of predominating force, yet it is not likely to occur to the workmen engaged in laying straight pipe till a long string has been mislaid.

Fig. 1 shows a side view or elevation of the correct arrangement of pipe and socket, together with an arrow exhibiting the circuitous route by which water can pass from the pipe to the surface, if the jointing material is faulty or not waterproof.

Fig. 2 is the side view or elevation of an incorrect arrangement of pipe and socket, with an arrow showing how the escape of water from the line is facilitated by the poor judgment shown in laying the line in the manner indicated.

Fig. 3 shows a view from above or plan of a main line and tee branch. The lines are both correctly laid.

Fig. 4 is the plan of a main line wrongly laid and a tee branch leading therefrom. As there is a bell on the branch from the tee, the side line cannot be laid with joints reversed, unless that bell or one on the line pipe of the branch be knocked off.

Fig. 5 shows a plan of the main line and wye branch as they should be laid. It exhibits by means of an arrow how the stream from the branch is compelled to turn to a course inclined 45 deg. to the course of the main current.

Fig. 6 shows what would be the outcome of trying to connect a wye branch to a main line which had been thoughtlessly built with bells reversed. The stream coming down the branch would be obliged (1) to run uphill and (2) would oppose the current flowing in the main line. By slightly tilting the wye so that the branch would slope toward the main pipe, the first fault could be entirely corrected, but for the other there is no such easy cure. The only remedy for that is to use a tee branch or to commence to construct the main line correctly from a point just below the wye onward, arranging the equivalent of two bells on one section of pipe, the lower bell being a artificial sleeve of cement completely surrounding the break in the line, where the two socketless ends of the sections of pipe come together.

Records of Early Coal Mining

That coal was mined in the days of the ancient Britons is proved by the discovery in a Monmouthshire coal mine of one of the flint axes used in those days, and there is documentary evidence extant, showing that in Anglo-Saxon times, about the year 852, an abbot received as part rent, 12 loads of coal, while in 1180 a grant of coal-bearing land was made to a collier in the vicinity of Coundon, Durham county. It is known, too, that coal was burnt in London, to a slight extent, in the fourteenth century because an unsuccessful attempt was made in 1306 to stop its use on the ground that it was injurious to health, and in 1381 it was made an article of trade.

An improvised temporary overcast may be constructed where two roadways cross by hanging brattices and erecting air pipes through which the return air passes.

DISCUSSION by READERS

Comment, Criticism and Debate upon Previous Articles, and Suggestions from the Experience of Practical Men

Reversing Air Current in Fiery Mines

In the course of a paper entitled "An Experiment on the Effects of Reversing a Main Air Current," read before the Institution of Mining Engineers (London), by James Bain and Dr. J. S. Haldane, the authors said the pit selected for the test was Bannockburn No. 3, belonging to the Alloa Coal Company, Limited. Describing at considerable length how the experiment was carried out, they then proceed to discuss the results, and conclude that when the air current is reversed, the air does not travel backward *en bloc*. A great deal of mixing and eddying evidently occurs, with the result that the effects of reversal are spread over a considerable period, so that it takes several hours for the air to attain a steady composition.

This fact is of importance, not only as regards the effects of reversal, but also insofar as it shows that smoke or afterdamp will only gradually attain its maximum concentration when passing through the workings of a mine, and will be but gradually washed out again by a supply of pure air. This, the author says, is of much importance in connection with prospects of rescue and the risks to rescuers in cases of fire or explosion.

In the second place, it appears to them that reversal of the air checks, for the time, the issue of firedamp and blackdamp from the air spaces communicating with the open workings. This is only natural, for, on reversal of the air current, the atmospheric pressure is suddenly increased in all parts of the mine, but more especially in the (normal) return airways.

The difference in pressure is commonly about 6 in. of water-gage, or half an inch of mercury; this will, of course, tend to drive air back into the air spaces connected with the open workings, and check the flow of firedamp, etc., from these air spaces into the roads. It must be understood that this statement refers only to places where exhaust fans are used, as is general in Europe and in the anthracite regions of America.

It would seem, therefore, from the experiments conducted by Messrs. Bain and Haldane, that reversal of the main air current is a considerably less risky operation, even in a fiery mine, than is commonly supposed. In this respect, however, they do not wish to attach too much importance to the single series of observations which they have made. They would rather recommend that opportunities should be taken of making similar trials in other mines provided with arrangements for reversal.

Among the features of interest that an analysis of the air presented, the following are noted:

Excess of carbon dioxide (CO_2) and deficiency of oxygen (O) run parallel with excess of firedamp, in the air after a reversal without the occurrence of an explosion, the percentage deficiency of oxygen being (in the samples taken) about double the percentage of firedamp. If, therefore, owing to any accidental or other cause, the ventilation was so much diminished that the roads became charged with foul air, this air would contain only about 1.5 per cent. of firedamp, when the oxygen fell to 17.5 per cent., at which point lights would cease to burn.

When the firedamp rose to 6 per cent., the oxygen would have fallen to 9 per cent., and seeing that as much as 12 per cent. of oxygen and 6 per cent. of firedamp are the minimum proportions at which even a feeble ignition of firedamp could in any circumstances occur, it seems that, as indicated, the mere slowing of the air current would never produce an explosive atmosphere along the roads. In numerous other mines, whether worked with naked lights or with safety lamps, the conditions are more or less similar.

R. O. E.

Manchester, England.

Excessive Splitting of Mine Air

There has been a long continued discussion of the subject of splitting of mine air and it is one which is so important that it deserves all the fervor which has been expended on it. On the one hand, we have mines with few splits, where the air passes from heading to heading, continuously gathering smoke and the foul exhalations from men and mules and lamps till it receives and deserves the expression "soup," which is often applied to it.

In a gaseous mine, such an air current becomes slowly explosive by the presense of firedamp as it travels through the mine, and the further it travels, the more explosive it becomes.

There are strong objections to this system of continuous ventilation. With it, are necessary very high pressures of air, just as high voltages are necessary when electric currents travel in series and not in parallel. All such high pressures involve leakage and make it hard to keep brattices sufficiently tight. It becomes increasingly hard to ventilate such workings and any ventilating system where this method is carried out consistently will eventually break down. Under such a disadvantage, no fan can deliver as much air to the faces as it could where splits were numerous.

High pressures probably increase the violence of an explosion, and the high speeds necessarily adopted make safety lamps less safe, blow out the miners' lights and raise the coal dust. Worst of all, any calamity, as a mine-fire explosion, tends to be fatal in its consequences to those in the workings nearer the point of intake, who might entirely escape if splitting had been judiciously conducted. And as has been seen, the explosive qualities of the mine gas are more marked at the working places furthest romoved from the intake, so that an explosion in a continuously ventilated mine is likely to involve all the workings.

I am inclined to think that some of the advocates of moderately split or unsplit air-currents are influenced too much by the brisk breezes of air which are used in continuous mines. They appear very satisfactory; there is an abundance of air to inhale, but the quality of the ventilation is really the crucial consideration. A baleful wind. full of carbon dioxide, firedamp or nitrous fumes, or deficient in oxygen, is but little preferable to a milder breeze of air fresh from nature's filters outside the mine.

Legislative Action in Regard to Splits

We find that some, or all of these considerations (we may not be able to determine which) have caused the legislators of Pennsylvania to require that not more than 70 men shall work in one current in a bituminous mine. The law of West Virginia puts that number at 60, though these States permit mine inspectors to increase the numbers to 90 and 80 respectively. Utah requires not more than 75 in a split.

When splitting is omitted, doors are frequent and an open door near the intake end of the workings is the equivalent of a stopped fan. The Pennsyl-

vania bituminous-mining law obviously does not favor their use. "No permanent door," says Art. IX, Sec. 1, "shall be erected or allowed to remain in the main entry in any mine, unless its removal shall be deemed impracticable by the inspector." The objection to doors is sixfold; they leak, they cut off the ventilation whenever a trip passes them, they may be left open and cause an explosion, they too often involve expense, and in one case at least a door by ignition has caused a mine fire followed by a disastrous explosion; moreover, in many cases on steep-grades they are a menace to driver and mules and destroy rolling stock.

ARGUMENTS AGAINST SPLITTING

Looking at the other side of the question, we have mines with the air split till it travels so slowly it has no vitality. This is to be avoided. Such air cannot sweep firedamp or carbon dioxide. The small amount of air arranged to travel in any split is unequal to the work of diluting the gases and still more unequal to the work of removing them. But it is feasible with good main airways and powerful fans to provide plenty of air because the splitting makes the resistance low, so that plentitude of air is obtained without excessive velocity in the working places. Unfortunately, the average mine is conducted on a slow plan. Too many headings are working at once, and none working at very high pressure, and as regulation is usually unscientific, the slowest working places have air in plenty and the others hardly enough to deflect a light.

FRANCIS N. GOFF.

Pittsburg, Penn.

The British Colliery Lass

The coal-mining industry in America has not tolerated the employment of women in or about the mines; through legislation, English practice is about to adopt the same principle. A few comments on the subject may interest COAL AGE readers.

The British Coal Mines Bill, having passed through the committee stage, will be reported to the "House" for third reading this autumn. A provision has been inserted in the bill to the effect that no girl or woman, other than those employed on or before Jan. 1, 1911, shall be permitted to engage in colliery (pit brow) work at any time. The government does not approve the clause and at the third reading will endeavor to have it expunged.

Some extravagant arguments have been employed, both on behalf of and against the employment of these women, who have been described as the "Junos of the pit brow." It may be said that the work they have to do is neither so bad nor so good as opposing parties have endeavored to prove. There are many sturdy, bright-eyed women among them; but while occupation in the open air may have transformed some of them into living embodiments of the classic Juno, it must be confessed there are others less fortunately circumstanced.

Occasionally cars get off the rails, and to replace them it is necessary for the girls to exert their utmost strength. As this is work to which as a sex they are not accustomed, there is considerable liability to overstrain. Where cars do not have to be handled by the girls, objection to their employment is less pronounced.

GIRLS' PAY SELDOM EXCEEDS $2.50 PER WEEK

It is important to note that the Miners' Federation of Great Britain has expressed the opinion that the work is not fit for

TYPE OF BRITISH COLLIERY LASS EMPLOYED IN LANCASHIRE FIELD

women and girls, but even here there is a suspicion that their earning power regulates the view in some measure, for she is a fortunate pit-brow girl who exceeds $2.50 a week.

Whatever the ultimate decision may be, the deputation sent to the Home Secretary to protest against the new clause has made the worker on the pit brow the "girl of the hour." Everywhere the girl members of the deputation were received with interest and respect, and they were even taken to have tea on the terrace of the House of Commons, being also afforded an opportunity for "doing" the show places of the city of London. Undoubtedly it was the supreme moment in the lives of many of the girls, who will look back with pride and pleasure upon the "picnic," whatever fate may have in store for their occupation.

While they created some stir and sensation in their picturesque clogs and shawls, the lassies, during their visit to London, were admittedly welcomed with some little amusement. There was greater interest in the "Juno of the Pit Brow" than sympathy for the cause she had traveled so far to advocate.

J. R. ENRIGHT.

Wigan, England.

Gas and Oil Lines as a Menace in Mining

So far we have no record of gas lines being broken by surface movement consequent on mining accompanied by the contamination of the mine air by the escaping gas. In fact where blowing fans are used the mine pressure is greater than the atmospheric, and there is no tendency for gas to enter the mine unless the pipe is confined by being buried beneath the surface. It is owing to this last condition that the Consolidation Coal Company is arranging for the uncovering of all buried gas lines of small diameter passing over its mines.

The larger pipes are usually left in situ, and a contract entered into with the gas company providing for the sale of sufficient coal to maintain the gas line in place without danger to the miners below. It is said that the gas companies show a keen sense of their obligations to coal companies in this matter, readily permitting the coal company the use of the maps for the purpose of locating all wells and pipe lines and making every provision to protect the mines from damage, though the mining law of West Virginia is deficient in provisions covering this necessary coöperation between mining and gas or oil companies.

When wells are located, the coal company is informed and a location satisfactory to that corporation is chosen. These general statements do not refer to the smaller gas companies. To watch and arrange for the control of these, a man is engaged to keep himself posted as to the erection of new rigs and the building of new lines. The public prints recently gave a somewhat lurid account of the flooding of a mine with oil from a line destroyed by mine workings. Whatever the degree of truth in that sensational story, the facts remain that when the coal bed mined is thick and the breaks consequently large, such floodings or seepages are to be dreaded and their occurrence avoided.

A German method of lessening dust in longwall mining is to force water at high pressure into the face through the drill holes, thus saturating the coal as well as helping to break it down.

SOCIOLOGICAL DEPARTMENT

A Bureau Devoted to the Welfare of Miners Everywhere, and Especially Designed for the Betterment of Living Conditions In Mining Communities—COAL AGE will be Glad to Print Any Suggestions or Ideas of Value to this Department

First Aid Work

SPECIAL CORRESPONDENCE

About the year 1891, Thomas Boundy, living in the anthracite-coal town of Jermyn, Penn., wrote a story entitled "Martin Diamond's Ambition: A Tale of the Mines." The hero of the story was a motherless boy, who, while studying to become a physician, found it necessary to work part of his time in the mines. One day an accident occurred and Martin, through the elementary knowledge gained from his studies, was enabled to be the means of saving two or three lives.

Before the story was printed, the manuscript was submitted to Dr. M. J. Shields, then a practising physician of Jermyn, for corrections and suggestions. Later the story was printed in the *Jermyn Press*, but before its publication Dr. Shields had decided to crystallize the lesson drawn from Thomas Boundy's story, and Jermyn, Penn., became the birthplace of the first-aid association movement in the coalfields of this country. Dr. Shields and Thomas Boundy continued for some years to nurture the "infant plan." In 1900, together, they published a "First Aid Handbook."

The great growth of the movement and the relation of Dr. Shields to its present activities as lieutenant of the U. S. Medical Relief Corps, working directly under Major Lynch, of the American National Red Cross Society, are too well known to require further mention at this time, as the purpose of this article is to deal with the social value of the first-aid movement in mining communities rather than with its history.

A RESPONSE TO NATURAL LAW

Herbert Spencer said that to understand sociology (the science of society) one should have preparation in the study of biology (the science of life). We know how the various parts of the body coöperate—one part contributing to the needs of another. You stumble and bump your knee, and how quickly the hands respond to the "emergency call" of the knee and rub away the pain! The response of the operators and men in the first-aid movement has been similarly prompt. In the span of a few years, we have seen the appointment of mine inspectors, the starting of the first-aid movement, the provision for scientific mine-rescue work, the opening of mining institutes, State-wide and local, and the creation of the Bureau of Mines, so that today the subject of mine safety is the concern of all the more intelligent men around the mines, the operators, physicians, foremen and other employees. The extent of the change we cannot easily realize without reflection, so steadily and naturally has it taken place.

THE NEED OF FIRST AID

At a soft-coal mine, a few years ago, a Polish carpenter was repairing a tipple. While fastening a timber he reached out too far, lost his balance and fell to the railroad. Several bones were broken, his head was severely cut and skull fractured. The hospital was 35 miles away and no means of transportation except the local combination train which was not due to leave for a couple of hours.

Many willing hands and sympathetic hearts would gladly have responded to the moans and pleading of the injured man, but not one of his fellow workmen present knew how to give that "First-Aid" that might have meant relief and life to him.

Finally the doctor came, unfortunately a student fresh from a medical college—long on cigarettes and professional bearing, but short on the horse-sense and deep human sympathy that we feel assured mark him in these later years. Well, he gave the fellow a "jab" of morphine, lit a cigarette and told the men to get the "hunky" on the train and he would take him to the hospital.

Think of that ride to the hospital! Thirty-five miles away—changed from one train to another four times—wounds and fractures not dressed! He died in the hospital.

VIEW OF RECENT FIRST-AID MEET, ANTHRACITE COAL COMPANIES, INKERMAN, PENN.

The men composing the first-aid associations and the "squads" in the various communities are of the progressive type. The nature of the work is evidence that these men are inspired by unselfish motives and the constant practising of the principles of the movement increasingly develops the altruistic spirit. This spirit once aroused leads them to take part in the general activities of their home communities. Thus their awakening consciousness finds opportunity to express itself in a way that contributes to the general welfare and progress.

The regular contact the men have with the physicians who instruct them is of more than "technical" value. I recall a pleasant and instructive meeting with an association. The physician in charge led the men in an interesting discussion on anatomy and physiology, then he talked to them on laws of health and sanitation and closed his discussion with a strong appeal to the men on the opportunity to serve their fellow men not only when injured but in the ordinary course of home and community life.

The deep emotion that is aroused in the men by the knowledge that the general public and the chief officers of State and nation are watching and commending the work being done, enlarges their humanity. Then the discipline of the training and the competition in the contests develop that self control which is imperative in the betterment of human society.

The Liquor Problem in Mining Communities

In the first place we state most emphatically that all miners do not drink liquor, and that among the miners we find many of our most sober and industrious citizens. But that there is a serious liquor problem in mining communities and that the problem requires practical consideration is generally conceded by mining men.

A study made recently, with the cooperation of several men prominently identified with coal mining, revealed several interesting facts.

First. A mine superintendent with over 40 years' experience in coal mining and a close observer of the general conditions prevailing in mining communities, says: "I don't know of anything that has caused such blight, shame, sorrow and ruin in the homes of the miners as that resulting from the liquor traffic.

"One of our miners beat his wife without mercy. She was left in a helpless condition and required the services of a physician. In order to discover the facts and endeavor to prevent a recurrence of the beating, I had the man, his wife and the wife of the saloonkeeper brought to the office. I learned that the wife was compelled by her husband to keep whisky in the house all the time and that sometimes he would drink a quart after supper, and if the supply ran out the wife would receive a beating.

"A short time ago a miner's wife came to see me the day after pay day. She asked me to speak to her husband. He had received his pay the day before and had gone to a saloon with it and was still there. She said they had five children and she had no money to buy bread and shoes and no money to pay rent. These are but sample cases. There are hundreds of them." *It is a social problem.*

The Economics of Insobriety

Second. In some instances the normal production of the mine is reduced from 10 per cent. to 15 per cent.

A well known mine manager states that, "Last week we lost fully 15 per cent. of our normal output on account of the liquor consumed at a couple of weddings and christenings."

Fifteen per cent. reduction of the normal output at that mine in one week! *It is an economic problem.*

One coal company official says: "Were it in my power I would destroy the whole liquor traffic. But as that is impossible under present conditions, the only thing left for those of us who interest ourselves in the welfare of the men and the industry is the *regulation* of the traffic, and here you come up against a variety of opinions, all advanced by well meaning people, but many of them impractical."

I recall an instance where a coal company tried to prevent the sale of liquor to the men employed in its mines, and three days after the order went into effect, the men went on strike and refused to work until the beer wagons were again permitted to enter the town. The order was withdrawn! *It is a complex problem.*

The Variant Local Conditions to Be Met

Regarding some of the obstacles to be met in attempting to apply remedial measures, we quote a coal-company official who has given the subject considerable study:

"We have to take account of the present status of the liquor traffic, and work within the limits of the law. The Brooks law, which obtains throughout Pennsylvania, is susceptible of a variety of interpretations. This is due to the large latitude allowed the judges of the different countries. Under such conditions, it will be almost impossible for a plan of regulation to be adopted that will meet the requirements of all the counties. Each county must be treated as a separate entity.

The Question of Regulation

"In the counties where there are mining communities, the question of regulation presents itself in a way entirely different from a mercantile or agricultural community. It has usually been considered more difficult to deal with the mining communities because of the foreign character of so many of the population. My experience and observation lead me to the conclusion that this very fact of the majority of the population being foreign ought to make the governing of the communities easier instead of harder. These foreigners are from countries where the evidences of governmental authority are ever before them, and give them a respect for law such as the native born never have. It is not only respect, but borders on fear. Coming to this country, they not only see others violating the law with impunity, but themselves are taught how they can do likewise.

As an illustration: In many mining villages there are licensed saloons. These are supposed to be under certain restrictions as to when and how much they shall sell to their patrons. But these same patrons, foreigners, know that such restrictions are merely nominal, and that the only real restriction is the will of the saloonkeeper, who is in the business to sell all he can. Then in districts where there are no licensed houses he sees the activity of the liquor agent and of the solicitor for orders from the breweries. These various agents operate supposedly under the rules of the local county courts, as issued by the judge. But that they violate those rules is well known to anybody who takes the trouble to watch their methods. And they instruct their patrons how they may violate the rules of court. The sole purpose is to increase their sales.

"I regard this feature of the business, the activity of the brewery agents, as the most difficult we have to deal with, and the most pernicious. Their methods of soliciting orders and delivering the same to houses of the miners make for an increased consumption and consequent intoxication of the people. The final result is a decreased efficiency, so far as the men are concerned, and in the homes a lowering of the social and moral status."

However, there are men in the coal-mining and other industries that have discovered sane, practical methods for dealing with this social and economic problem of the ages in a way which tends to minimize the evil results of the liquor traffic as it relates to mining operations.

The evils of the liquor problem in mining communities can be minimized! We do not intend, in this series of articles, to discuss present or possible liquor legislation, but to present studies of plans that tend to *minimize* the drink evil.

We will deal with facts rather than theories.

EXAMINATION QUESTIONS and ANSWERS

To Encourage, Assist, and Instruct Those Preparing for Firebosses, Mine Foremen, and Inspectors Examinations. Selected and Original Questions Are Carefully Answered And Fully Explained

Observance of Danger Signals

Examination for inspectorship of mines, bituminous-coal district of Pennsylvania, May, 1909. (By special request.)

1-A. What precautions would you enforce to avoid the danger in mines to employees going beyond danger signals?

I would arrest and prosecute all those violating the law by passing a danger signal. I would instruct the mine foreman that it is his bounden duty under the law to report to me at once in writing all employees who have passed danger signals. I would point out to him that neglect to make such report is a misdemeanor and that the report must be made whether the foreman has personal or other definite information of the violation. See article 5, section 5.

I would instruct the mine foreman to be careful that he or his assistants or his firebosses instruct all non-English speaking miners as to what a danger signal means, using an interpreter for that purpose. Article 5, section 1.

And as signals may be overlooked or misunderstood, I would require that they be as legally provided, uniform, of approved design and in good condition. Failing this I would require them removed from the mine under article 3, section 3, and good standard signals provided.

But where safety lamps are used, I would advise the management to require the firebosses to give out the lamps to the men working in their respective districts and withhold lamps entirely from those men whose places are unsafe.

1-B. What precautions would you enforce to avoid dangers to employees incident to electrical and other mechanical haulage?

To secure the safety of men not engaged in the operation of cars or motors or other haulage appliances, I would observe carefully whether the old haulways comply with the legal provisions of article 4, section 8.

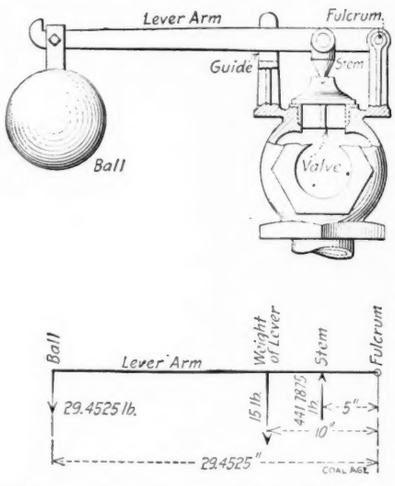
For branch roads, shelter holes must be 30 yd. apart or less and for main roads 15 yd. or less. They must be 2½ ft. deep and 4 ft. wide. Rooms will serve for shelter holes if not further apart and if clear for 3 ft. from the heading rib. I would see that all shelter holes are on one side of the entry, are all whitewashed, level with the haulage road and clear of obstruction.

All entries driven after June 1, 1911, the date of passage of the new Act, should provide a clearance of 2½ ft. continuously on one side of a passing car, unless I believe, as inspector, that the condition of the roof will not permit it.

(The use of electric haulage involves certain wiring and general electric requirements which are very extended and do not properly relate to haulage but to transmission and safety in the presence of gas. These matters will be treated shortly in a comprehensive review on article XI of the new bituminous-mining code of Pennsylvania in a complete and elementary manner.)

Safety Valve Regulation

The distance from the fulcrum of a safety valve to the stem is 5 in., the diameter of the valve seat is 2.5 in., the weight of the lever 15 lb. and the center of gravity 10 in. from the fulcrum. If



FORCES ACTING ON A SAFETY VALVE

the ball weighs 75 lb., how far should it be set from the fulcrum, in order that the valve will blow off at a boiler pressure of 90 lb. per square inch.

The area of the valve seat equals the square of the diameter multiplied by $0.7854 = 2.5 \times 2.5 \times 0.7854 = 4.90875$ square inches.

Such a downward pressure of the lever arm must be provided as will equal 90 lb. for every square inch of valve seat; that is, as there is a valve-seat area of 4.90875 sq.in. there must be a downward pressure of $90 \times 4.90875 = 441.7875$ pounds.

The upper figure shows a typical safety valve with the parts marked thereon, showing plainly its manner of action. Below it is a diagram showing the forces acting on a line, which represents the lever arm. The "moment" of any force, whether that force be a weight or a steam pressure or what not, equals that force multiplied by the distance from the fulcrum. The distance from the fulcrum is what we otherwise term the "leverage." When a body is balanced all these moments sum up to zero, the upward moments balancing the downward. The moment of the stem equals the pressure on the valve, which the stem holds down, multiplied by the distance of the stem from the fulcrum. From what we have deduced that pressure is 441.7875 lb., and from the question the distance is 5 inches.

So the moment $= 441.7875 \times 5 = 2208.9375$ in.-lb. and its direction is upward.

The weight of the lever is 15 lb., as you will see from the question, and the center of gravity of the lever is 10 in. from the fulcrum. The moment of a body is the same as it would be if the weight of it were all concentrated at its center of gravity.

Therefore, the moment of the lever equals $15 \times 10 = 150$ in.-lb. and the direction is downward. We have considered so far an upward movement of 2208.9375 in.-lb. and a downward moment of 150 in.-lb. and the difference between them is $2208.9375 - 150.0000 = 2058.9375$ in.-lb. The moment of the regulating weight or ball is downward and it is the only moment yet to be considered, so it must equal 2058.9375 in.-lb. Its weight is 75 lb. (see question) and so we must multiply 75 by such a number as will make it equal to 2058.9375 or $\frac{2058.9375}{75} = 29.4525$ in. So to provide for the valve to pop off at 90 lb. pressure per square inch, the ball should be moved out till it is 29.4525 in. from the fulcrum.

West Virginia Questions

GLEN JEAN EXAMINATIONS—GENERAL PRELIMINARY QUESTIONS

Ques. E—What are the requirements as to the distribution, measuring and recording of air currents? What must be done when the current is seriously interrupted?

Ans.—Sec. 15 of the mine law says:

"And the mine foreman shall measure the air current *at least* twice a month at the inlet and outlet and at or near the faces of the advanced headings, and shall keep a record of such measurements in a book, having a form prescribed by the chief of the department of mines. An anemometer shall be provided for the purpose by the operator of the mine."

When the current is seriously interrupted, the men must be withdrawn from the mine at once.

Mine Maps Must Be Made

Ques. G—What does the law say in regard to mine maps, (a) with reference to the information to be placed thereon; (b) as to their extension; (c) their accuracy; (d) to whom furnished, and (e) where they must be kept? (f) What penalty is imposed for failure to furnish a lawful map?

Ans.—(a) "The operator or agent of every coal mine shall make or cause to be made an accurate map or plan of such mine, on a scale to be stated thereon, of 100 or 200 ft. to the inch; such map or plan shall show the openings or excavations, the shafts, slopes, entries, airways with darts or arrows showing direction of air currents, headings, rooms, pillars, etc., and such portions of such mine or mines as may have been abandoned, the general inclination of the coal strata and so much of the property lines and the outcrop of the coal seam of the tract of land on which said mine is located, as may be within 1000 ft. of any part of the workings of such mine." (Sec. 5.)

(b) "The operator shall, twice within every 12 months, and not more than 7 months apart, while the mine is in operation, cause such mine to be surveyed and the map thereof extended so as to show accurately the progress of the workings, and property lines and outcrop as above provided; and he shall immediately thereafter notify the inspector of his district, who shall forward to the said operator, or his engineer, the maps held by such inspector to be extended as above required." (Sec. 5.)

(c) "If at any time the chief of the department of mines has reasons to believe that such map or plan or extension thereof furnished in pursuance of the preceding section, be materially incorrect, such as will not serve the purpose for which it was intended, he may have survey and map or plan or the extension thereof made or corrected and the expense of making such survey and map or plan of extension thereof under the direction of said chief of department of mines, shall be paid by the operator, and the same may be collected as other debts are recovered by law; and if found correct, the expense thereof to be paid by the State."

(d) They must be furnished to the mine inspector. (Sec. 5.)

(e) He must keep them among his records, turning them over to his successor in office. No copying of these maps may be made without permission of the operator or his agent. (Sec. 5.)

(f) There is no penalty attached to the failure to furnish a lawful map. "But if the operator or agent of any coal mine shall neglect or fail to furnish to the mine inspector of his district any copy or map or extension thereof, the mine inspector is authorized to cause a correct survey and map or plan of said coal mine or the extension thereof to be made at the expense of the operator of such mine, the cost of which shall be recoverable from said operator as other debts are recoverable by law."

Law Controlling Air Stoppings and Haulage

Ques. H—What are the law's requirements with reference to (a) doors, (b) overcasts, (c) stoppings, (d) breakthroughs, (e) air splits, (f) refuge holes, (g) slopes, (h) haulways and (i) motor roads used for travel?

Ans.—(a) Sec. 12 of the mine law requires that "doors on main haulways shall be avoided in gaseous mines where practicable, and where used they must be substantially built and hung so as to close automatically."

(b) "Overcasts built of masonry or other incombustible material and of ample strength shall be adopted in all mines generating firedamp."

(c) "All stoppings must be built of suitable material, which shall be approved by the district mine inspector." (Sec. 11 and 12.)

(d) "Breakthroughs for air shall be made not to exceed 80 ft. apart in pillars." (Sec. 11.)

(e) "Not more than 60 persons shall be permitted to work in the same air current; provided, that a larger number, not exceeding 80 persons, may be allowed by the district mine inspector where, in his judgment, it is impracticable to comply with the foregoing requirement." (Sec. 11.)

(To be continued)

Maintenance of Pillar Thickness

Ques.—A haulway and an airway run parallel and 60 ft. apart between centers; it is desired that they be turned 45 deg. to the left, yet that they maintain the pillar between them at the original thickness. If the airway lies to the left of the haulway, how much further must the center line of the haulway be driven beyond the center line of the airway before the desired turn is made?

Ans.—In the figure, let *A* be a point on the center line of the airway at the turn in the same. Let *B* be a similar point in the haulway, the location of which is dependent on *A* and is yet to be determined. Drop two perpendicular lines *A C* and *A D* from *A* to cut the center line of the haulway before and after the turn of the heading at *C* and *D*, respectively. It is clear that *C B* is the distance being sought, that is, the length that the center line of the haulway must be extended beyond that of the airway before being turned. *A C*, being the distance between centers, must be 60 ft. long.

A C is at right angles to *C B* and *A D* to *B D*. Now, *C B* and *B D* are inclined to each other at 45 deg. It is easily seen that lines which are at right angles to other lines are inclined to one another at the same angle as are those other lines to each other. Hence *A C* and *A D* are inclined to each other 45 deg., and that is equivalent to the statement that *C A D* is an angle of 45 deg. Since the triangles *A B C* and *A B D* are precisely similar, angles *C A B* and *D A B* are equal. Therefore, *C A B* must be half as large as *C A D*, or must equal 22 deg. 30 min.

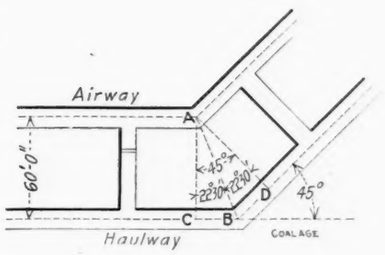
$$\frac{CB}{CA} = tan.\ CAB = tan.\ 22\ deg.\ 30\ min.$$

But

$$CA = 60\ ft.$$

$$CB = 60 \times tan.\ 22\ deg.\ 30\ min. = 60 \times 0.4142\ ft. = 24.85\ ft.\ or\ 24\ ft.\ 10\tfrac{1}{4}\ in.$$

Thus the haulway must be driven 24 ft. 10¼ in. at its center line further than



Maintaining Pillar Thickness

the airway at its center line in order that on making the required turn the thickness of the chain pillar may not be changed. It will be seen that, whatever the angle of turn may be, the distance of retarded turning always equals the distance between the lines considered, multiplied by the tangent of half the whole angle turned, and that the longer heading along the lines considered is longer by twice the distance of retarded turning.

Example—If angle of turn is 15 deg., retarding of turn is 7.89 ft. If angle of turn is 90 deg., retarding of turn is 60 ft., where the distance between center lines is 60 feet.

If angle of turn is 120 deg., retarding of turn is 86.60 ft. where the distance between center lines is 50 feet.

COAL and COKE NEWS

Editorial Correspondence from our own Representatives in Various Important Mining Centers, and a Record of Legislative and Other Action Affecting the Coal Industry

Washington, D. C.

The date for opening the controversy involving the West Virginia coal region and the Pittsburg bituminous region as competitors for the Great Lakes coal trade has been set for Oct. 23. Louis D. Brandeis, the Boston lawyer, who has appeared in several important cases before various government bodies, including the advanced-rate case, before the Interstate Commerce Commission, held a conference here on Sept. 28, for the purpose of consulting with witnesses and arranging the order of presentation of argument.

The case in which he will appear is Boileau vs. certain railroads. The complainant is a mining engineer of Pittsburg, who has become interested in the situation, while the roads concerned are those chiefly engaged in moving coal from the bituminous region to the Great Lakes. The point at issue is a request to the Interstate Commerce Commission to reduce the rates on coal for the short haul from the Pittsburg district to lake ports, these rates being now about 88c. a ton, while the rates from the West Virginia district to the Great Lakes region, a haul several times as long, are about the same.

The argument of the complainant in the case is that the West Virginia coal ought to be allowed to go direct to tidewater, while the Pittsburg district coal should find its natural outlet in the Great Lakes region. Propositions have already been made to the shippers who are agitating the question, looking toward an increase of the West Virginia rates, but they have not been content with that solution of the question. They want the rates from the Pittsburg district reduced and they will urge, as in the advanced rate cases, that the coal roads serving the district are making so large an income already as fully to warrant the reduction in rates and yet leave them adequate earnings.

Connellsville Coke Rates

The controversy in regard to the coke rates from the Connellsville district to South Chicago bids fair to rival in severity and importance the issue raised by the West Virginia coal-rate cases. Briefs have just been filed in this controversy on behalf of the Wisconsin Steel Company vs. the Pittsburg & Lake Erie Railway Company in complaints affecting the rates from various points in the Connellsville district to South Chicago, Indiana Harbor, and other consuming ports.

The Coal Roads' Case

The Federal Government has filed in the Supreme Court of the United States at the opening of the October term, its new brief in the so called "coal cases." This is the case of "the United States appellant vs. the Reading company *et al.*," etc. Cross appeals are brought from the United States Circuit Court of the eastern district against the Philadelphia & Reading, the Lehigh Valley, the Central Railroad of New Jersey, and other roads and their affiliated coal companies. The argument of the Government reviews the history of this protracted litigation in the lower courts and then makes an assignment of error.

The principal errors assigned by the Government, stated broadly, are the dismissal of the charges in respect to (1) the general combination, (2) the 65 per cent. contracts, (3) the combination of the Erie railroad and the New York, Susquehanna & Western railroad and their coal companies, (4) the combination of the Philadelphia & Reading railway and the Central Railroad of New Jersey and their companies, (5) the holding by the Erie railroad of the capital stocks of the Pennsylvania Coal Company, the Delaware Valley & Kingston railroad, and the Erie & Wyoming Valley railroad, (6) the holding by the Lehigh Valley railroad of the capital stock of Coxe Brothers & Co., and (7) refusal to dismiss without prejudice what was dismissed.

A lengthy description of the anthracite coal deposits is given and the coal tonage of the various roads is analyzed and described. Argument is presented to show that the interests of the defendant railroads in the shares of coal-owning companies and in anthracite coal lands are in violation of the constitution of Pennsylvania; that the railroads engaged as defendants, in transporting coal of the same kind from a sole and restricted area of production to the principal market, are competitive, although their tracks may not reach the same mines; that all the defendants are engaged in a combination of general scope by which the Reading company and other railroads and their affiliated companies control the anthracite-coal business, and that the 65 per cent. contracts thoroughly discussed in the lower court, whether considered as part of a plan or singly, restrain trade in violation of the Sherman law. Argument is also presented to show that the control through stock ownership by the roads of the various companies mining coal is a combination in restraint of trade.

Pennsylvania

Scranton—One of the oldest and largest breakers in the anthracite region, the Hampton, of the Lackawanna company, is to be demolished within a short time and the coal which was handled there will be sent to the Hyde Park and the Continental collieries, Scranton.

The executive boards of the three districts of the anthracite miners' union have issued a call to all of their constituent locals, announcing that the annual convention will be opened at Pottsville on Monday, Oct. 30. It is at this convention that the demands of the miners, which are to be embodied in the agreement to be submitted to the operators, will be considered and formulated.

Wilkes-Barre—The East Boston breaker of the Payne Coal Company, near here, burned Oct. 3. The loss is placed at $100,000. Smoke filled the passageways of the mine, and at first it was thought that four pumpmen had been suffocated. The men, however, made their way out of the workings by a second opening. Four hundred and thirty men and boys are thrown out of work.

Drifton—Five men were drawn into an air shaft and smothered to death by an inrush of culm at the Drifton colliery of the Lehigh Valley Coal Company on Oct. 4. The men were engaged in tearing down a 40-ft. stack at the top of the air shaft, which was surrounded by a bank of slate and culm. When the stack fell the bank rushed into the opening and carried the men with it.

Ashland—It will not be long before the Humboldt workings of the Lehigh Valley Coal Company, which are awash with water to the top of the slopes as left 15 years ago by Linderman and Skeer when their lease ran out, will be opened for operation. It is planned to work them from the Oneida mines, which are now operated by the Valley company.

Pittsburg—The final transfer of title was made Sept. 30 in the deal by which the H. C. Frick Coke Company, the coke subsidiary of the United States Steel Corporation, purchased the Colonial Coke Company holdings from the Pittsburg Coal Company and the coking-coal holdings of the Monongahela River Consolidated Coal and Coke Company, an interest in

which the Pittsburg Coal Company holds control. The prices are $1450 an acre for about 7000 acres of coking coal controlled by the Colonial Coke Company, this price including nearly 1000 ovens and other improvements, and $850 for about 9000 acres of the Monongahela River company, there being no improvements in connection with the latter acreage, so that the transaction involves about $17,000,000.

West Virginia

The Davis Coal and Coke Company is arranging to open another mine on its property at Dartmoor, which is near Weaver, W. Va. The mine will be located in the Beaver Creek seam district, and will, in all probability, have a maximum capacity of 1000 tons daily.

The United States Coal and Oil Company, which has extensive holdings in Holden, W. Va., has purchased 25,000 acres of undeveloped coal land on Blackberry creek, in the eastern part of Kentucky, and the operations in this section promise to rival in importance those in Logan county. The development of this land will be started at once, it is said.

Illinois

Edwardsville—An attempt to sell the personal property of the De Camp Coal Company was stopped by an injunction. The execution for the sale was issued after 160 miners sued the company for a month's pay. The miners claim wages due to the amount of something like $12,000.

The Peabody Coal Company's mine No. 3, at Marion, the top works and washer of which were destroyed by fire last spring, resumed operations, Oct. 1. The washer has not been rebuilt.

Harrisburg—A recent gas explosion in the Wasson mine, killed one, and severely burned twelve.

Centralia—A fire in the mine of the Junction City Coal Company, the latter part of September, caused a heavy loss.

Marion—The "White Ash" mine of the defunct Standard Collieries Company, at Marion, has been allowed to fill up. The new mining machines, cars, rails, etc., were all left below.

Nokomis—Six miners suffered broken legs and two were probably fatally injured when the cage in the Peabody mine fell 80 ft. on Oct. 6.

Ohio

Columbus—One of the final details in the reorganization of the Columbus and Hocking Coal and Iron Company as the Hocking Valley Products Company was the filing of a mortgage given by the latter company on all its coal, oil, mineral and timber lands and other property in Ohio to the Bankers' Trust Company, of New York City, as trustee to secure an issue of $2,000,000 of bonds.

Considerable interest has been aroused in Ohio and adjoining coal States over litigation challenging the rates of coal shipments from the fields to the consumer or to lake ports.

In the case of the New York Coal Company, of Columbus, against the Hocking Valley Railway Company, in which the Ohio Public Service Commission ordered a sweeping reduction in rates from the Hocking valley almost to Toledo, the application of the complainant to have the matter reopened was argued Oct. 6. The complainant avers that the reductions made were not all that was warranted by the evidence adduced and seeks to have still more radical reductions ordered. The Franklin County court has granted a temporary injunction restraining the shippers from putting into effect the reduction in rates, but the railroad company was compelled to give a heavy bond to cover shipments made in the meantime.

Indiana

Clay Mining—The miners of district No. 8, comprising Clay county, have taken up the matter of preparing a scale for mining clay and shale. Several of the mines have disposed of the clay, which was formerly consigned to the dump, by selling it to factories, and the miners believe that clay will be dug here after the coal industry has ceased. It is therefore deemed necessary that a mining scale should be adopted now to avoid disagreement in the future.

Weekly Pay—The miners are still agitating the matter of a weekly pay in accordance with the law passed by the last legislature, but it is rumored that the subject will be settled for the present by abiding by the request of the operators to continue the semi-monthly plan until the expiration of the contract next April.

The Ehrlich-Pierce Mining Company has incorporated for the purpose of opening and equipping shafts for mining coal and clay. The company's headquarters will be at Turner, Clay county.

The Miami Coal Company, which last year opened a new mine south of Clinton, is opening a second one within a quarter of a mile of the first, and has recently taken on 100 men and plans to add about that many more within the next ten days. Mines in the Clinton district are beginning to be more active, but the activity usual at this time of the year is not yet apparent.

The Wizard Coal Mining Company, of West Terre Haute, has filed articles of incorporation. The initial capital stock is $15,000, and the declared purpose of the company is to carry on the business of mining coal, clay and other minerals.

Kentucky

The Stewart Coal Company, of Ashland, Ky., incorporated under the laws of West Virginia, has changed its name to the Letcher Coal and Coke Company. It has decreased its capitalization from $400,000 to $200,000.

The Consolidation Coal Company is starting to build a model mining town on Wright's Fork of Boone, in Letcher county, similar to the city of Jenkins, now being built on the Elkhorn, in the Elkhorn coalfield. The Nicola Building Company, of Pittsburg, has already received a contract to build 600 miners' houses on Wright's Fork, the work to be started at once.

Texas

Newcastle—Shaft No. 4 of the Belknap Coal Company, of Newcastle, is nearing completion and will soon be in operation. A very substantial tipple has been erected, which is 66 ft. high.

Washington

Vancouver island coal properties, lying between Nanaimo and Ladysmith, embracing 2400 acres and estimated to contain approximately 30,000,000 tons, have just been consolidated into an operating proposition by Andrew Laidlaw, of Spokane, and J. D. Farrell.

Glacier—Development work at the anthracite-coal camps near Glacier will continue throughout the winter.

Alabama

Flat Creek—A coal washer of large capacity is to be erected at Flat Creek by the Pratt Consolidated Coal Company.

Colorado

Delta—A fire in the Summerset mine of the Utah Fuel Company resulted from shot firing, which ignited the timber. Four miners barely reached the bucket in advance of the resultant gas and smoke. The Government rescue car summoned from Trinidad was not needed. The mine was flooded and the fire easily subdued.

California

Amador County—The W. E. Downs coal mine, near Campo, is soon to be opened. A new engine and boiler have arrived on the ground, and it is understood that the shaft will be unwatered immediately and the development work commenced.

Oklahoma

McAlester—A fire destroyed the tipple, the washer, boiler and engine houses and several other buildings about the mine of the Milby & Dow Coal Company at Dow. The loss is estimated at $20,000.

COAL TRADE REVIEWS

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

The general tone of the coal market, with a few exceptions, is dull and heavy; however, an optimistic view is taken of the expected winter trade. The protracted summer that prevailed in most sections, particularly in the East, the curtailment policy of a number of the large steam users and the smaller crops in the Northwest, have had a singularly depressing effect on the coal trade generally.

In the Eastern market, prices seem at times about to reach the low point of 1909, and contracts are made to suit the purchaser. The mines of the Pittsburg district are working from 60 to 70 per cent. capacity, which is lower than during the same period of last year. Excess of production is evident throughout the East and prices are only moderately firm.

The anthracite trade is normal, both East and West. The coke trade has suffered as a result of the curtailment in production of pig iron, upon which it is directly dependent.

The Rocky Mountain and Pacific coast trade is in much better condition, being nearly normal. Shipments in from Australia to Pacific-coast points are a number of cargoes behind, and the probability of transportation troubles due to strikes on the Harriman system are making the trade active.

New York

The better grades of steam coal, of which there was an increased tonnage contracted for this year, are now moving on contract in substantial volume. At this season, and until navigation is closed by ice to the shoal-water points, the volume is constantly increasing; the consumers whose only method of transportation will be cut off when the rivers freeze, are stocking up to carry them over the period when navigation is closed.

The arriving and the standing tonnage at the New York piers, while not large, is sufficient to meet the demand, as the mines producing the better grades of steam coals are now working full time, and have had the benefit, for the past two or three weeks, of a satisfactory car supply. There is but little current business going here at the present time and not much is to be expected, when coal is purchased so largely on "year-around" arrangements, until the producers having the regular business, are unable to take care of their customers.

Inferior-grade steam coals do not find a ready market at the present time, as these coals are not purchased so generally on contracts, and have to depend more on the current demand for business. The supply of the better-grade steam coals is equal to the demand, and the inferior coals are always hard to dispose of.

Prices at the New York market for better-grade steam coals while not strong, are being held firm, especially by those shippers who are heavily contracted. For the inferior grades, prices are not so satisfactory.

Pittsburg

Bituminous—This year's coal tonnage is not proving as satisfactory as was expected. Production in the Pittsburg district during the first half of the year fell about 10 per cent. behind production in the first half of last year, but expectations were entertained that the second half of the year would make up the loss. This is not proving to be the case, and the year promises to close with a material loss from last year's tonnage, although still with a fairly good record.

Shipments in the lake trade have been uniformly behind those of last year, the total movement of soft coal from all districts in the lake trade through August being about three-quarters of a million tons below last year's tonnage. September, instead of showing an improvement over September of last year, has shown a slight decrease, and shipments during the balance of the season are likely to be light.

The demand for domestic coal was slow in opening up, but is now of good volume and the movement is practically normal. Demand for coal from manufacturing industries has shown a slight improvement since Sept. 1, as compared with July and August, but is hardly equal to the demand at this time last year. Operations at mines in the Pittsburg district average between 60 and 75 per cent. of full capacity.

Prices are moderately firm and at about the same general level as had obtained through the year. Slack coal has stiffened a trifle, owing to the lake shipping season being nearly over; lake shipments, being of ¾-in. coal, produce an abnormal quantity of slack. While a month or two past, sales were being made freely at 60c. and less, the market is now quoted at 65@70c., with little tonnage moving below 65c. Nut coal is a trifle easier, through heavier production of 1¼-in., and is easily obtained at $1.10. Mine-run continues to be quoted at $1.15, and this price is not generally being shaded, ¾-in. being held at $1.25 and 1¼-in. at $1.35@1.40, a number of producers holding $1.40 as their minimum.

Connellsville Coke—The year thus far has been the poorest the Connellsville coke trade has seen since 1908, particularly as to tonnage. The output this year to date has averaged only a trifle above 300,000 tons weekly from the Connellsville and lower Connellsville field, the poorest average since 1904, with the exception of the year 1908. The outlook is for a production of about 16,000,000 tons.

In this loss of tonnage the Connellsville coke trade has followed the iron industry, which consumes almost its entire output; prospects are that production of pig iron this year will be about 23,750,000 tons, the smallest since 1905 with the exception of 1908. The year's Connellsville coke production, however, shows a somewhat greater loss, as compared with records of a few years ago, than does this year's iron production. In other words, a slightly smaller percentage of the country's total pig-iron production is being made with Connellsville coke than was the case four or five years ago. This change is due partly to the growth in byproduct coke manufacture and partly to increased use of other cokes from this general district.

The economic question of the day is whether the original Connellsville district (including the addition of a decade ago, the lower Connellsville, Masontown or Klondike) will ever adopt the byproduct process. Old-time operators can hardly conceive of such a possibility, while others shrink at the enormous capital investment involved. The United States Steel Corporation, by far the largest interest, is so positioned as to use Connellsville coal in byproduct ovens, if at all, by shipping the coal to the byproduct plants located at the blast furnaces. Every steel interest which considers the adoption of byproduct coking, pays great attention to the question whether an easy offset to a considerable part of the capital investment in byproduct ovens may not be found by using coal from another district, in which an acreage sufficient for a half century's supply may perhaps be purchasable at much less than a Connellsville acreage sufficient for a couple of decades.

The Connellsville coke market has been extremely quiet in the past fortnight. Nearly all furnaces now operating have contracts covering either the balance of this year or a longer period. A very few are uncovered, but a month ago concluded it would be cheaper to buy coke from month to month for the rest of the year than to pay the considerably higher price demanded on three- or four-month contracts. The prompt market is firm at $1.50@1.55, contracts over balance of year being nominally $1.70@1.75.

Foundry coke is quiet, consumers being covered by contracts. Odd lots of prompt 72-hour coke of standard grade can be picked up at $1.80@1.90, cokes selling at less than $1.80 being generally inferior. Contract coke of standard grade is quoted at $2@2.25, the favorite contract price being $2.10.

St. Louis, Mo.

The condition of the coal market in St. Louis has been unsatisfactory from an operator's standpoint, and while coal has been going at a reasonable figure (as far the retailer is concerned), the domestic trade has not been as good as usual at this period of the year. There are some good reasons for this falling off in trade, the principal one of which is the crusade against the smoke nuisance.

The shipping interest are making less money now on their coal than they were last June, for a fall business was anticipated at that time, and on the strength of this expectation, prices kept up. At the present moment, with everything to indicate an overproduction, there is not much to be hoped for in the way of any immediate advance in prices.

Standard coal from the territory adjacent to East St. Louis, and coming in on the 52c. freight rate, is selling as follows per ton f.o.b. the mines:

2-in. lump	$0.90 to $0.95
3-in. lump	0.95 to 1.00
6-in. lump	1.05 to 1.10
Mine-run	0.75
Screenings	0.25 to 0.30

The higher-grade coals from the Standard field are bringing anywhere from $1.75 to $2.25, at the mines, but the supply of this coal has exceeded the demand for several weeks.

The middle-grade coals from the Standard field, such as Mt. Olive, etc., are bringing anywhere from $1.15 to $1.25 at the mines for domestic lump, and various prices on other sizes.

There is practically no Springfield coal coming in, and very little from any other field, with the exception of Williamson and Franklin counties. Some tonnage from Murphysboro Big Muddy is moving in at from $2 to $2.25 at the mines for domestic sizes. In the northwestern market, this coal is known as New Kentucky, and is without question the best coal produced in the State, in any great tonnage.

Franklin and Williamson county prices per ton are as follows, f.o.b. the mines, taking a 67c. freight rate to St. Louis:

WILLIAMSON

6-in. lump	$1.40 to $1.50
3x6 egg	1.40 to 1.50
No. 1 nut	1.05 to 1.15
No. 2 nut	0.90 to 1.00
Screenings	0.35 to 0.40
Mine-run	0.90 to 1.00

FRANKLIN

6-in. lump	$1.60
3x6 egg	1.50
No. 1 nut	1.40
No. 2 nut	1.15
No. 3 nut	0.85

There is some coal moving in from the Du Quoin field at various prices, taking a 57c. freight rate. There is also some little coal moving in from Montgomery county, but not in any great tonnage. There has been a fair movement of anthracite in all sizes, but not as great as might be expected, and chestnut is somewhat hard to get for this market. During the past month more than 100 cars of West Virginia smokeless has come in, and there is still a fair tonnage moving. Anthracite and smokeless f.o.b. St. Louis are quoted as follows per ton:

Chestnut	$7.20
Egg and stove	6.95
Stove	6.70
Smokeless lump and egg	$4.75 to $5.00
Smokeless mine-run	3.75

The tonnage of gas-house and byproduct coke has exceeded this year the tonnage of any previous year, and is still moving in good volume. Gas house is worth from $4.65 to $4.75, and byproduct is going at about $5.

Indications are that there will be a rise in the domestic market on all the bituminous coals in the course of the next 10 days, as the domestic supply has not been laid in, and with the first touch of cold weather, the demand will tax the capacity of delivering companies.

Chicago

Officials of the Illinois Central deny that there has been any serious interruption to the movement of coal on that line as a result of the pending strike of shop workers.

J. K. Dering and C. M. Moderwell have been elected directors of the Chicago Coal Dealers' Association.

Prices in net tons to retail dealers and steam users are quoted as follows:

	F.o.b. Chicago	At mine
Steam lump	$2.07	$1.25
Mine-run	$1.82 to 1.87	$1.00 to 1.05
Screenings	1.02 to 1.12	0.20 to 0.30
FRANKLIN COUNTY		
Lump, egg and nut	$2.70 to $2.80	$1.65 to $1.75
Screenings	1.45 to 1.55	0.40 to 0.50
CLINTON		
Domestic lump	$2.17 to $2.27	$1.40 to $1.50
Steam lump	2.00 to 2.10	1.25 to 1.35
Mine-run	1.77 to 1.82	1.00 to 1.05
Screenings	1.12 to 1.22	0.35 to 0.45
COKE		
Connellsville	$4.50 to $4.65	
Wise county	4.50 to 4.65	
Byproduct, egg and stove	4.75 to 4.90	
Byproduct, nut	4.55 to 4.65	
Gas house	4.75 to 4.90	
CARTERVILLE		
Lump	$2.65	$1.60
Egg	2.65	1.60
No. 1 washed	2.70	1.65
No. 2 washed	$2.15 to 2.30	$1.10 to 1.25
HARRISBURG		
Domestic lump and egg	$2.60	$1.60
Mine-run	2.15	1.15
Screenings	$1.40 to 1.50	$0.40 to 0.50
Springfield		
Domestic lump	2.07	1.25

Boston

Bituminous all-rail has been generally slow. The low prices at tide cut away a considerable tonnage that would normally be railed from Pennsylvania, and all the shippers have suffered on that account. The mines with better established selling connections are now getting fair business, but the operators have been obliged to make as low figures as have obtained within recent years. Prices have ranged from 85c. on coals higher in volatile to $1.30 and $1.35 for fancy brands from the more favorably known districts. On the whole, soft coal (all-rail) has been sluggish and dull in tone.

Anthracite, both at tide and all-rail, has been about normal; that is, with no very marked change from other and recent years. The usual April and May demand at tide lasted into June on certain sizes, such as free stove and hard egg. The Kennebec and Penobscot rivers opened much later than in 1910, and the long severe winter left many of the dealers bare of coal. Early in September a cool wave turned consumers toward the dealers with considerable urgency and it was not long before the anthracite shippers had request for prompt shipments on all sizes. A feature of anthracite this season is the still constantly increasing demand for chestnut size, notwithstanding the 25c. advance over stove last spring. This seems the rule with every dealer and one ceases to be surprised that broken and egg are so seldom included in cargo schedules. Pea and the steam sizes have lately shared the generally active market. The year is certain to be favorable for anthracite.

Water freights from Hampton Roads have been about 60c. all season on large tonnage, 3000 tons and upward, with the usual differentials for ports south and east of Boston. The supply of bottoms has been ample, and the rate named is as low as sail tonnage can be run.

Buffalo, N. Y.

The prices of bituminous range from $2.50 for Pennsylvania three-quarter to $2.40 for mine-run and $2 for slack, with some mines selling slack considerably lower than this. Allegheny valley grades sell at about 20c. lower. Coke has been practically lifeless since the iron market became so slack, the price being $4.25 for best Connellsville down to $3.50 for stock coke.

Since the freshets that created so much disaster at Austin, Penn., there has been much trouble in the Allegheny valley mines, some of them being completely flooded for a number of days.

The fall trade in bituminous is not

enough yet to stiffen prices, though they must improve as soon as consumers begin to stock up against possible stoppages of production next spring.

Philadelphia

A canvass of the various dealers reveals the fact that orders are coming in more plentifully every day, and in some cases they have run out of certain sizes of coal; their requisitions on the wholesalers are marked rush. October is a good selling month, and the present one gives no indication of going back on the tradition.

Most of the companies are working full time, and it is understood that the demand, except in one or two sizes, covers everything from "broken" to "barley." As a matter of fact, it looks as though there would be a limited supply of the small sizes before the winter is over. The almost infallible index of a stronger market lies in the fact that most all of the individual operators are now holding to circular prices, except in some cases where an inferior grade of coal is offered, and the shading of prices with these concerns is a necessity. Generally, it looks as though the anthracite trade was on the threshold of a prosperous season.

The bituminous trade is still dull. Improvement is noticed in some grades of coal, but, as a rule, the market has a tendency to stand still, rather than progress.

Cleveland, Ohio

About the only improvement in the coal trade has been in the demand for domestic business, which is a natural coincidence at this season of the year.

Prices for middle district and No. 8 coal are: $1.05 for mine-run; $1.15 for ¾-in.; $1.40 for 1¼-in.; slack, 45@50c.; No. 8 mine-run, 90@95c.; ¾-in., $1@1.05; 1¼-in., $1.10@1.15; slack, 35@40c.

Slack seems to be somewhat of a drug on the market; other conditions in the general trade are depressed, and the usual amount of fine coal is not being consumed.

The lake trade continues spasmodic, a great deal of coal still remaining on cars at Cleveland and other Lake Erie ports, waiting for boats to take the tonnage to the upper lakes. The congested condition of coal at the head of the lakes due to delays in removing it at the upper docks, and the fact that large tonnage boats will not handle coal to the head of the lakes and return light, is the primary cause of there being so much fuel still remaining on the Lake Erie ports.

The ore coming down from the upper lakes, has fallen off materially this year on account of the surplus ore being on hand from last season's shipments. The only way the coal at the Lake Erie ports can be handled this year, is to load the tonnage between now and the close of navigation and take the coal to the head of the lakes and hold it there in storage during the winter months for early shipments in the spring. This will insure an adequate supply for the Northwest during the long winter months.

Cincinnati, Ohio

Of the domestic-coal market in general it may be said that it was better a few weeks ago than it is at present. The volume of sales is greater now than then, but not as much so as the season should warrant. It was thought that the domestic demand had made an unusually early start and preparations were made by wholesalers to meet a continuing and growing market; however, for some reason, there has been a lull, and the sales seem to be only about what are forced by the condition of the weather. Reports from the northern part of the State are to the effect that the demand is good, but the weather there is much colder than here.

Local operators and wholesalers have finished a good lake season and, so far as learned, all have been able to complete their contracts. River coal men are coming into their own again here, due to favorable stages of the Ohio river above and the completion of a government dam just below the city, giving them a good local harbor.

Milwaukee, Wis.

Prices on all kinds of coal have been fairly well maintained, and as the time for actual consumption is drawing near, the increased demand will doubtless eliminate any weakness which may have been apparent in the dull season.

Altogether the outlook is decidedly more promising, and the trade in general is bound to show a decided improvement from now on.

Columbus, Ohio

Prices have been well maintained during the past month even under the slow buying of September. The circular issued by Ohio operators, Sept. 1, has been generally adhered to.

Prices which now prevail in Ohio districts are as follows: Domestic lump, $1.50, f.o.b. mines; ¾-in., $1.35; nut, $1.15; mine-run in the Hocking valley, $1.05@1.15; mine-run in eastern Ohio districts, 95c.@$1.05; nut, pea and slack, 50@60c., and coarse slack, 45@55c. There is a good demand for the fancy grades of domestic coal which sell from $1.50 as high as $2 per ton. These grades include rescreened, hand-picked and other specially prepared coals.

Nashville, Tenn.

About 90 per cent. of the coal used in this market is from the western Kentucky fields, and the remainder from the Jellico and Virginia fields. The prevailing prices on west Kentucky coal range about as follows per ton:

Standard lump coal	$1.15 to $1.25
Standard nut	0.95 to 1.00
Mine run	0.80 to 0.90
1⅛-in. screenings	0.25 to 0.30

All country trade has been fairly well supplied with their coal for the winter.

Indianapolis

The retailers and wholesalers say that conditions are not far from normal, considering the fact that warm weather continues. While the mines are working on short time, domestic coal has moved well and steadily, during the past three months, and the supplies equal those of former years at this date.

Salt Lake City, Utah

Prices on our market are firmly held and are $2.25 for lump, $2.15 for nut and $1.25 for slack, f.o.b. cars at mine.

Retail conditions in Salt Lake are both good and bad. Good, in that trade is brisk, having been stimulated by two weeks of cool weather, and by "strike talk"; as a consequence, September business was ahead of the same month in 1910. The bad side results from the fact that the producers have been entirely unable to fill dealers' orders, and the storage or reserve stocks have been drawn upon heavily. These stocks should remain in reserve until Dec. 1, to 15, at least.

Portland, Ore.

Following are the prices asked here, per ton, including cost of delivery to points within the city proper:

Japanese	$7.50	
Washington lignite	$7.00@ 7.50	
Australian	10.00@10.50	
Rock Springs, Wyo.	10.00@10.50	nut $9.50
Diamond, Wyo.	10.00	
Carbon Hill, Wash., lump	10.50	
Carbon Hill, steam	7.50	
Newcastle, Wash.	7.00	
Beaver Hil, Ore.	9.00@ 9.25	
Blacksmith coal	17.00	
Pennsylvania anthracite	18.00	

The Beaver Hill coal is brought here by steamer from Coos Bay and sells for $8 on the dock.

San Francisco

Stocks of coal are below normal and dealers anticipate an active fall and winter trade. The following are the prevailing wholesale prices per ton at San Francisco:

Wellington, from B. C., clean	$8.00
Wellington, from B. C., average	7.50
Australian, from B. C., clean	8.00
Australian, from B. C., average	7.50
Washington, from B. C., clean	6.50
Washington, from B. C., steam	5.00
Utah, Wyoming, Colorado and New Mexico, for domestic use only clean	8.15

To these prices the retail dealer adds from $2 to $3 per ton, accordingly as delivered direct from cars or from storage.